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SYMPTOM PREVALENCE SURVEY

Gloucester High School
Gloucester, Massachusetts

GOVERNMENT DOCUMENTS
COLLECTION

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BACKGROUND/INTRODUCTION

HISTORY OF THE PROBLEM

As a result of ongoing complaints of health effects attributed to the renovation of Gloucester High School (GHS), the Bureau of Environmental Health Assessment (BEHA) conducted indoor air quality inspections and a symptom prevalence survey during the winter and spring of 1997 at the request of Daniel Ottenheimer of the Gloucester Health Department (GHD).

It was reported to BEHA that the main building of GHS was undergoing renovations in a three-year, three-phase plan. Year-round renovations were planned, resulting in work being done during the school year. After the gymnasium floor installation in 1996, students, teachers and school personnel complained of odors and poor indoor air quality in this facility. In order to assess this problem, the GHD had Diversified Environmental Corporation conduct a series of air quality tests in the school in December 1996. The air sampling conducted on December 20, 1996 found air concentrations of isophorone diisocyanate ranging from non-detectable to 0.0064 ppm. Follow-up samples taken later that same month indicated that levels had decreased. The isophorone diisocyanate in the air samples was attributed to the materials used to renovate the field house floor. However, complaints of odors and poor indoor air quality from students, teachers and school personnel continued after this air monitoring.

In January 1997, BEHA was contacted by the GHD concerning the health issues raised by these air samples, and health and environmental concerns. After being apprised of the history of the problem and air monitoring data, the BEHA responded to the health concerns in a two-fold manner. First, several indoor air inspections were conducted by BEHA staff during the winter and spring of 1997 to assess and make recommendations concerning the problems posed by the renovation and indoor air quality within the school. A report on these inspections was released in May 1997 to the GHD and school. The report identified problematic conditions that could adversely affect indoor air quality and made recommendations to correct the observed problems. BEHA also conducted a symptom prevalence survey to determine the health status of students, teachers and school personnel, and to help the local and school health personnel address needs for longer term follow-up health surveillance if symptoms were unusual and may be related to poor indoor air quality. The GHD and school officials had previously developed and implemented a medical support service with regard to this issue in conjunction with Addison Gilbert Hospital.

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Both the environmental inspections and data collection efforts were completed during the time frame of January through April 1997, when the science wing was being renovated. Therefore, these reports represent an assessment of the conditions during this phase of renovation. Completion of the science wing construction would be expected to improve conditions found in the school during this renovation.

FACILITY LAYOUT/POPULATION

The building complex can be divided into three different sections: the renovated section, the field house, and the unrenovated section (Figure 1). At the time of this survey, the renovated section of the school contained classrooms, the library, the central office and a theater-style study hall. Included with the renovated rooms was the science wing, which was under construction during the February 14th indoor air inspection. The science wing contained science labs, home economics, a pre-school area, and other classrooms.

This school contains a gymnasium, which is in the field house. The field house also contains classrooms for art and photography as well as locker rooms and other areas related to athletics. The gymnasium floor material was reported to emit a strong rubber-like odor.

The unrenovated section was between the science wing and the field house. The hallways in unrenovated areas had no dropped ceiling, and ventilation vents, electrical wiring, and other utilities were exposed. Classrooms showed signs of renovation activity (numerous holes in the ceiling and walls for utilities), but no active construction was observed in these areas during these inspections.

ENVIRONMENTAL INSPECTION RESULTS

BEHA conducted three indoor air inspections of the school on February 7, February 14 and April 28, 1997. During these inspections, carbon dioxide levels were elevated over 800 parts per million parts of air (ppm) in roughly three-quarters of the rooms surveyed February 14 and over half the rooms surveyed April 28. These results were likely attributed to lack of mechanical ventilation in the unrenovated rooms. In renovated rooms, these results were likely attributed to decreased fresh air intake, lack of supply and exhaust ventilation balancing or exceedance of design capacity.

The migration of odors from the field house area was noted during each inspection in the unrenovated areas of the school. Several recommendations to decrease odor migrations made in the BEHA environmental inspection report included: running all exhaust fans to ventilate the gymnasium, enclosing the balcony from the gymnasium to prevent odor penetration, and keeping all fire doors between the field house stairwell closed to prevent odor migration.

To improve air quality in the school and decrease the impact of renovations the following additional recommendations were made: repairing the ventilation system, sealing off renovation section from the occupied areas of the school and instituting a vigorous dust control program.

Prior to the April 28th inspection, at the request of the GHD, the school hired a full time industrial hygienist to better address the environmental hygiene issues at the school. The following steps were to be taken to minimize renovation impact of the occupied areas of the school: (1) renovated classrooms would be under negative pressure ventilation, under a HEPA filter; (2) regular testing for respirable dusts and total volatile organic compounds (TVOC) would be conducted; and (3) construction would be limited to after school hours. The industrial hygienist also planned to eliminate other possible sources of odor in the school that are not related to the renovation, such as elimination of TVOC-containing cleaners and school supplies.

SYMPTOM PREVALENCE SURVEY

Because GHS was under renovation while occupied by faculty and students, concerns were raised about exposure to different construction materials and their effects on the health of the occupants. The medical support services already implemented provided assistance to students, parents and school personnel. However, the GHS, school health personnel, and health professionals involved with the medical support services felt that it would be advisable to carry out symptom prevalence survey to obtain representative health information for the entire school community. To gauge the extent of possible health impact of the indoor environment on faculty and students, BEHA conducted a building-wide symptom prevalence survey that included the students, teachers and school personnel during March and April of 1997.

A similar survey was also conducted in a comparison high school (hereafter, "the comparison school") to provide BEHA with comparison information that would be helpful in the interpretation of the symptom prevalence data collected at GHS. Other comparison information was obtained through published reports of similar health surveys. Symptom prevalence surveys are used by public health officials to obtain a timely representative picture of health status as it may relate to indoor air quality and to provide information to determine whether more focused epidemiological studies or health surveillance should be done.

This report summarizes the BEHA findings of the symptom prevalence survey of students, teachers and school personnel at GHS.

METHODS

The prevalence of symptoms experienced by building occupants is usually obtained through use of a self-administered questionnaire. The symptoms included in this type of questionnaire are those that have been reported as commonly experienced in buildings with indoor air quality problems. Self-administered questionnaires have been used to assess symptom prevalence in different types of buildings throughout the United States, Europe and other parts of the world. They are used to systematically collect building-related health and environmental complaints. The information collected, in conjunction with results from assessment of the indoor environment, can be used to evaluate of the problem, and to recommend appropriate follow-up if warranted.

STUDY POPULATION

At the time of the BEHA survey, GHS had approximately 910 students (grades 9 through 12) and nearly 130 teachers and school personnel; and the comparison school, where no health complaints associated with indoor air quality had been reported, had approximately 515 students (grades 7 through 12) and nearly 60 teachers and school personnel. At both schools, all the students in grades 9 through 12 were invited to participate. Full-time teachers and school personnel as well as temporary workers (e.g., substitute teachers) also were invited to participate. The communities where the two schools are located were evaluated for demographic similarity (e.g., income and education). A complete student list and school employee list were obtained from officials of each school to facilitate administration of the survey.

SURVEY INSTRUMENT DEVELOPMENT

Two self-administered questionnaires were developed by BEHA to assess the prevalence of reported symptoms: one for students (Appendix A) and another for teachers and school personnel (Appendix B). These questionnaires were closely modeled on those used previously by BEHA as well as ones used by the National Institute of Occupational Safety and Health (NIOSH) and the U.S. Environmental Protection Agency (USEPA). Both included questions on specific symptoms (ones commonly experienced by occupants of buildings with indoor air problems), on perceived air quality, and on personal factors. Seventeen categories of symptoms were included in the questionnaire. Similar questions were used in GHS and in the comparison school. In addition, the GHS questionnaires included some questions specific to GHS. For example, questions were asked on activities and times spent in the gymnasium to assess their impact on symptom prevalence rates.

SURVEY ADMINISTRATION

Prior to administration of the survey to GHS students, the school notified parents or guardians that all students would be invited to participate (Appendix C). The parents/guardians of the students in the comparison school were notified by the municipal school board that their children would be invited to participate. This allowed them to decide whether or not to have their children participate in the survey.

At both schools, BEHA staff delivered copies of the survey, which were then given to students, teachers, and school personnel. During the morning session, homeroom teachers distributed the student questionnaires. Each student was asked to complete the questionnaire, seal it in an accompanying envelope, and return it to the homeroom teacher. The teacher then returned all completed and sealed surveys to a BEHA staff member on-site. Faculty and staff were likewise asked to complete questionnaires and return them to a designated location. In addition, questionnaires were mailed to those students, teachers and school personnel who were away from school for various reasons.

To ensure the confidentiality of all information collected, the surveys at the GHS and the comparison school were approved and the investigation was authorized by the Commissioner of Public Health under Massachusetts General Laws Chapter 111, Section 24a, protection.

DATA ANALYSIS

Symptom prevalence rates were calculated using NIOSH criteria (Malkin et al, 1996). A response of "at least once a week in the last 4 weeks" was considered a "yes" for calculating prevalence rates. Prevalence rates were calculated for experiencing one or more of the symptoms in a group at least once a week, then having the symptom(s) improve when one was away from the school building. Several groups of symptoms were defined corresponding to organ systems. These groups included upper respiratory symptoms (e.g., sore or dry throat, stuffy or runny nose); respiratory symptoms (e.g., wheezing, chest tightness, cough); and neurologic symptoms (e.g., headache, dizziness or lightheadedness).

Additional symptom groups were defined which required that a participant have more than one symptom, one day a week or more, that improved away from the school building. Information collected from students on specific locations was sorted and converted, by using teachers' activity charts, to room/area codes. Once completed, identification numbers were assigned to the surveys. The numbered surveys with cover pages taken off were then contracted out for data entry and, for quality control purposes, double data-entry was performed. Logical checks of the completed

databases and resolving discrepancies with the original survey added another quality control procedure to the process. Statistical analysis was conducted by using Epi Info 6.04a.

RESULTS

GLOUCESTER HIGH SCHOOL

Student Symptom Prevalence Survey

Seven hundred and ninety-nine people, representing approximately 88 percent (799/907) of all the students enrolled at the GHS during the time of the BEHA investigation, completed the questionnaire. Respondents included 419 females and 380 males, the aggregate having a median age of 16 years. Among them, 11.3 percent currently smoked, 12.8 percent were former smokers, 74.3 percent had never smoked, and 1.6 percent did not give any information on their smoking status (Table 1).

Symptom prevalence rates by gender are shown in Table 2. The most commonly reported symptoms were unusual tiredness, fatigue or drowsiness (55.2 percent); stuffy or runny nose, or sinus congestion (46.4 percent); headache (42.9 percent); coughing (35.7 percent); sneezing (30.4 percent); and sore, hoarse, or dry throat (29.4 percent). The most commonly reported symptoms that improved when GHS students left school were unusual tiredness, fatigue or drowsiness (36.3 percent); headache (34.9 percent); stuffy or runny nose, or sinus congestion (24.4 percent); and dry, itching, or irritated eyes (20.3 percent).

Prevalence rates of grouped symptoms are presented in Table 3. Female students had greater prevalence rates of grouped symptoms, including the multiple symptom group typically associated with indoor air quality complaints (23.6 percent of females and 16.1 percent of males).

Respondents were asked if there was a time of day when their symptoms usually became worse or more frequent: 17.8 percent reported that this happened predominantly in the morning, 16.8 percent cited the afternoon, and 47.4 percent reported no pattern. When asked what part of the week their symptoms most often became worse or more frequent, 7.3 percent reported that this happened predominantly at the beginning of the week, 4.8 percent indicated the end of the week, and 66.8 percent reported no pattern (Table 1).

Prevalence rates of reported diagnosed medical conditions among students are given in Table 4. Of all the GHS students, 13.9 percent reported asthma diagnosed by a physician (13.1 percent of females and 14.7 percent of males), 4.5 percent reported eczema, 6.8 percent reported hayfever, and 10.3 percent reported migraine.

GHS students' perceptions of environmental conditions in the school building (Table 5) are as follows:

- Twenty-six percent reported unusual or unpleasant dust;
- Eight percent reported vehicle exhaust odor;
- Twenty-two percent reported musty or moldy odors;
- Thirty-four percent reported chemical odors;
- Twenty-five percent reported "other" unusual or unpleasant odors;
- Forty-one percent reported that the air in the building was too dry;
- Nineteen percent reported that the air in the building was too humid;
- Forty-two percent reported that the air in the building was too stuffy.

Of all GHS students, 13.9 percent reported that the temperature in the school building varied from too hot to too cold; 42.3 percent reported that the temperature was too hot, and 5.6 percent reported that the temperature was too cold (Table 5).

Teacher and School Personnel Prevalence Survey

One hundred and twenty-four people, representing approximately 96 percent (124/129) of all GHS teachers and school personnel, completed the questionnaire. Of those 124 respondents, 71 were female and 53 were male. They had a median age of 48 years, and an average of 5 years working at GHS. Among them, 8.1 percent currently smoked, 31.5 percent of them were former smokers, 55.6 percent had never smoked, and 4.8 percent did not provide any information on their smoking status (Table 6).

Individual symptom prevalence rates are shown in Table 7. The most commonly reported symptoms were stuffy or runny nose, or sinus congestion (46.0 percent); unusual tiredness, fatigue or drowsiness (41.1 percent); dry, itching, or irritated eyes (30.6 percent); sore, hoarse, or dry throat (29.8 percent); and headache (25.8 percent). The most commonly reported symptoms that improved when GHS teachers and school personnel left school were unusual tiredness, fatigue or drowsiness (29.8 percent); sore, hoarse, or dry throat (25.0 percent); stuffy or runny nose, or sinus congestion (23.4 percent); dry, itching, or irritated eyes (21.8 percent); and headache (19.4 percent).

Prevalence rates for grouped symptoms are presented in Table 8. Women had greater prevalence rates of grouped symptoms, including the multiple symptom group typically associated with indoor air quality complaints (22.5 percent of women and 17.0 percent of men).

Respondents were asked if there was a time of day when their symptoms usually became worse or more frequent: 21.0 percent reported that this happened predominantly in the morning, 16.9

percent cited the afternoon, and 42.7 percent reported no pattern. When asked in what part of the week their symptoms most often became worse or more frequent, 8.1 percent reported that this happened predominantly at the beginning of the week, 3.2 percent indicated the end of the week, and 68.5 percent reported no pattern (Table 6). These patterns are similar to those of GHS students (Table 1).

Prevalence rates of reported diagnosed medical conditions among employees are given in Table 9. Of all the GHS teachers and school personnel, 12.1 percent of the employees reported asthma diagnosed by a physician (14.1 percent of females and 9.4 percent of males); 7.3 percent reported eczema; 17.7 percent reported hayfever; and 9.7 percent reported migraine. As is normally observed with these types of surveys, women reported slightly higher prevalence rates of all medical conditions.

GHS teachers and school personnel's perceptions of environmental conditions in the school building (Table 10) were as follows:

- Thirty-three percent reported unusual or unpleasant dust;
- Fourteen percent reported vehicle exhaust odor;
- Fourteen percent reported musty or moldy odors;
- Thirty-seven percent reported chemical odors;
- Thirty-three percent reported "other" unusual or unpleasant odors;
- Four percent reported that the air in the building was too dry;
- Four percent reported that the air in the building was too humid;
- Fifty-three percent reported that the air in the building was too stuffy.

Of all GHS teachers and school personnel, 16.1 percent reported that the temperature in the school building varied from too hot to too cold; 49.2 percent reported that the temperature was too hot, and 5.6 percent reported that the temperature was too cold (Table 10).

Symptom Prevalence and Building Locations

Three hundred and seventy-four (or 46.8 percent) of the students and fifty-five (or 44.4 percent) of the teachers and school personnel reported that there were specific locations in the building where their symptoms occurred most often or became worse. GHS students complained most about the gymnasium and rooms 215, 101, 202, and 201. All four of these rooms were in the unrenovated section. They were physically closest to the areas of active construction activities during the time of the BEHA survey. GHS teachers and school personnel complained the most about the gymnasium, the main office, the hallways, and room 201.

The student respondents were asked how much time they had spent in the GHS gymnasium during the last four weeks, and symptom prevalence rates were calculated for each of three groups: those who reported that they had not spent any time at the gymnasium in the last four weeks, those who reported spending less than five hours per week there in the last four weeks, and those who reported spending over five hours per week in the last four weeks. The individual and grouped prevalence rates for these three groups were similar (Table 11 & Table 12). Prevalence rates of reported diagnosed medical conditions among these three groups of GHS students were also similar (Table 13). Since the total number of teachers and school personnel was small, no similar analysis was performed.

Perceived indoor environmental conditions in specific GHS locations are summarized in Table 14. The gymnasium, rooms 101, 215, and 102, and the hallways were the top five locations for complaints about dust. The gymnasium, rooms 215, 107, and 101, and the hallways were the most reported locations for odors. Lastly, the gymnasium, and rooms 2202, 2204, 202, and 215 were the most reported locations for stuffy air.

Comments from Survey Respondents

In addition to answering standard questions in the survey, most of the respondents, including students, teachers and school personnel, also took time to provide BEHA with additional comments on issues or concerns. These comments can be roughly broken down into two categories:

- Concerns about the indoor air environment in the building: construction noise; unusual smells and odors in the building, especially in the gymnasium; and dusty and dirty conditions in the school building.
- Concerns regarding health: some of the students, teachers and school personnel raised questions about the long-term health effects of indoor air in the building. Some were concerned that the chemicals used in the construction process might exceed health and safety limits.

COMPARISON HIGH SCHOOL

Student Symptom Prevalence Survey

Two hundred and forty-four people, representing approximately 91 percent (244/268) of all the students enrolled at the comparison school during the time of the BEHA investigation, completed the questionnaire. Respondents included 126 females and 118 males, the aggregate having a median age of 16 years (Table 15). Among them, 22.1 percent currently smoked, 18.4 percent were former

smokers, 57.8 percent had never smoked, and 1.6 percent did not give any information on their smoking status (Table 15).

Symptom prevalence rates by gender are shown in Table 16. The most commonly reported symptoms were unusual tiredness, fatigue or drowsiness (42.6 percent); headache (32.8 percent); difficulty remembering things or concentrating (30.7 percent); stuffy or runny nose, or sinus congestion (29.5 percent); pain/stiffness in back, shoulder, or neck (27.9 percent); coughing (27.0 percent); and sneezing (22.5 percent). The most commonly reported symptoms that improved upon leaving school were unusual tiredness, fatigue or drowsiness (28.7 percent); headache (15.2 percent); pain/stiffness in back, shoulder, or neck (9.8 percent); difficulty remembering things or concentrating (9.4 percent); and stuffy or runny nose, or sinus congestion (9.4 percent).

Prevalence rates of grouped symptoms are presented in Table 17. Male and female students had similar prevalence rates of grouped symptoms, including the multiple symptom group typically associated with indoor air quality complaints (4.0 percent of females and 6.8 percent of males).

Respondents were asked if there was a time of day when their symptoms usually became worse or more frequent: 12.3 percent reported that this happened predominantly in the morning, 5.3 percent cited the afternoon, and 59.8 percent reported no pattern. When asked what part of the week their symptoms most often became worse or more frequent, 4.9 percent reported that this happened predominantly at the beginning of the week, 1.2 percent indicated the end of the week, and 67.2 percent reported no pattern (Table 15).

Prevalence rates of reported diagnosed medical conditions among students are given in Table 18. Of all the comparison students, 20.1 percent reported asthma diagnosed by a physician (27.8 percent of females and 11.9 percent of males), 6.1 percent reported eczema, 9.4 percent reported hayfever, and 11.9 percent reported migraine.

Students reported the following environmental conditions in the school building:

- Twenty-nine percent of them reported unusual or unpleasant dust;
- Eleven percent reported vehicle exhaust odor;
- Thirty-seven percent reported musty or moldy odors;
- Thirty-nine percent reported chemical odors;
- Fifty percent reported “other” unusual or unpleasant odors;
- Thirty-six percent reported that the air in the building was too dry;
- Twenty-six percent reported that the air in the building was too humid;
- Fifty-seven percent reported that the air in the building was too stuffy.

Of all the comparison students, 27.0 percent reported that the temperature in the school building varied from too hot to too cold; 33.6 percent reported that the temperature was too hot, and 13.9 percent reported that the temperature was too cold (Table 19).

Teacher and School Personnel Prevalence Survey

Forty-seven people, representing approximately 80 percent (47/59) of all the teachers and school personnel in the comparison school, completed the questionnaire. Of those 47 respondents, 22 were female and 25 were male. They had a median age of 49 years, and an average of eleven years working at the school. Among them, 10.6 percent currently smoked, 39.8 percent of them were former smokers, 53.2 percent had never smoked, and 6.4 percent did not provide any information on their smoking status (Table 20).

Individual symptom prevalence rates are shown in Table 21. The most commonly reported symptoms were stuffy or runny nose, or sinus congestion (27.7 percent); unusual tiredness, fatigue or drowsiness (19.1 percent); coughing (17.0 percent); sore, hoarse, or dry throat (14.9 percent); pain/stiffness in back, shoulder, or neck (14.9 percent); headache (12.8 percent); and wheezing (12.8 percent). The most commonly reported symptoms that improved when the teachers and school personnel left school were stuffy or runny nose, or sinus congestion (8.5 percent); sore, hoarse, or dry throat (8.5 percent); unusual tiredness, fatigue or drowsiness (6.4 percent); coughing (6.4 percent); and headache (6.4 percent).

Prevalence rates of grouped symptom are presented in Table 22. The prevalence of multiple symptom group typically associated with indoor air quality complaints was 2.1 percent (none from women and 4.0 percent from men).

Respondents were asked if there was a time of day when their symptoms usually became worse or more frequent: 6.4 percent reported that this happened predominantly in the morning, 10.6 percent cited the afternoon, 2.1 percent cited the evening, and 44.7 percent reported no pattern. When asked what part of the week their symptoms most often became worse or more frequent, 2.1 percent reported that this happened predominantly at the beginning of the week, 2.1 percent indicated the end of the week, and 57.4 percent reported no pattern (Table 20).

The self-reported prevalence rates of physician-diagnosed conditions among employees are given in Table 23. Of all the teachers and school personnel in the comparison school, 10.6 percent reported physician-diagnosed asthma (9.1 percent of females and 12.0 percent of males), 10.6 percent reported eczema diagnosed by a physician, 21.3 percent reported hayfever, and 14.9 percent reported migraine.

Perceptions of environmental conditions in the school building, reported by the teachers and school personnel in the comparison school, were as follows (Table 24):

- Twenty-six percent of them reported unusual or unpleasant dust;
- Eleven percent reported vehicle exhaust odor;
- Twenty-three percent reported musty or moldy odors;
- Thirty-six percent reported chemical odors;
- Thirty-four percent reported "other" unusual or unpleasant odors;
- Forty-three percent reported that the air in the building was too dry;
- Two percent reported that the air in the building was too humid;
- Fifty-one percent reported that the air in the building was too stuffy.

Of all the teachers and school personnel in the comparison school, 27.7 percent reported that the temperature in the school building varied from too hot to too cold; 25.5 percent reported that the temperature was too hot, and 4.3 percent reported that the temperature was too cold (Table 24).

DISCUSSION

The symptoms investigated in this survey are commonly experienced in buildings with indoor air problems. The prevalence rates of symptoms experienced by GHS students, teachers and school personnel can be compared to two reference sources: data from the comparison school and data from published surveys with using the same survey methods. Because of the self-reported nature of these types of symptom prevalence investigations, the unique environmental characteristics of each building structure, and the extent of related discussion and the differences in perception of indoor environmental situations among the populations under study that had reported indoor air complaints, the comparison of symptom prevalence rates reported from different populations may vary somewhat. Overall, the symptom prevalence rates among GHS students, teachers and school personnel were lower than those which have been seen in buildings that have been reported in the literature to have had indoor air quality problems as well as lower than some other high schools investigated that had reported indoor air complaints. Although somewhat higher than rates from the comparison school, overall symptom prevalence rates among GHS teachers and school personnel were generally similar to those reported among office workers in Washington state non-problem office buildings (Nelson et al. 1995). It would not be unexpected to see some elevation in symptom prevalence survey in a school actively undergoing construction. It is important to note that key

information (i.e., data stratified by age and sex and comparable environmental data) is not available for more precise comparisons.

The symptoms most frequently reported by GHS students as well as teachers and school personnel were unusual tiredness, fatigue or drowsiness; dizziness or lightheadedness; headache; stuffy or running nose, or sinus congestion; dry, itching, or irritated eyes; cough; sneezing; sore, hoarse, or dry throat. Those symptoms are commonly associated with ventilation problems in such buildings, although other factors (e.g., odors, microbiological contamination) may also contribute (Stolwijk et al. 1991; Burr et al. 1996; Nordstrom et al. 1995).

During BEHA's inspections in February and April 1997, carbon dioxide was found above 800 ppm in over half the classrooms in GHS. Carbon dioxide is not a problem in and of itself. It is used as an indicator of the adequacy of the fresh air supply. As carbon dioxide levels rise, it indicates that the ventilation system is malfunctioning or the design occupancy of the room is being exceeded. When this happens, a buildup of common indoor air pollutants can occur, leading to discomfort or health complaints. This observation is supported by the symptom prevalence survey results. About 42 percent of students and 53 percent of teachers and school personnel reported that the air in the school building was stuffy, and that this was the most noticeable in the gymnasium, and rooms 2202, 2204, 202, and 215. The Massachusetts Department of Public Health uses a guideline of 800 ppm for publicly occupied buildings. A guideline of 600 ppm or less is preferred in schools due to the fact that the majority of occupants are young and considered to be a more sensitive population in the evaluation of environmental health status.

Unpleasant odors are usually among the causes of building-related complaints. Approximately 34 percent of students and 37 percent of teachers and school personnel from GHS reported chemical odors in specific areas of the school building, mainly in the gymnasium, the hallways, the main office, and rooms 215, 3105, 3111 and 319. The gymnasium floor had previously been reported by the GHD and school officials to produce a strong, rubber-like odor which appeared to be penetrating the unrenovated section of the school from the field house stairwell. This complaint was also supported by the survey results. Indoor air testing conducted in December 1996 revealed isophorone diisocyanate levels up to 0.0064 ppm in the gymnasium and main lobby, the OHSA time-weighted average (TWA) is 0.005 ppm. However, subsequent testing later that same month showed that isophorone diisocyanate levels were all under 0.005 ppm. Exposure to this type of chemical (i.e., isophorone diisocyanate) can lead to irritation of the upper respiratory system, or even more problematic respiratory or other health conditions (e.g., wheezing, asthma) among a

smaller number of individuals. However, in looking at symptom prevalence results, these types of health outcomes were generally within observed background rates, including asthma. While overall rates do no appear to be problematic, it is possible that a small number of sensitive individuals may react to these types of chemicals. For this reason, it is important to have a medical surveillance service in place to identify and address these individuals' needs, should environmental testing indicate detectable levels of isophorone diisocyanate. Besides the diisocyanate, other chemicals that were detected in most of the sampling locations in GHS, mainly in the gymnasium, the main lobby, and rooms 107 and 101 (rooms 215, 3105, 3111 and 319 were not tested) that may also have contributed to irritant reactions or produced nuisance odors, include asphalt fumes, stoddard solvent, diacetone alcohol, and ethanol. As the construction effort is completed and implementation of prior recommendations is accomplished, the potential for adverse health effects should decrease.

A small percentage of GHS respondents (21.8 percent of students and 13.7 percent of teachers and school personnel) also reported musty or moldy odors in localized areas in the school building (i.e., mainly in rooms 215, 107 and 101, the gymnasium and the hallways). During the BEHA inspections, a number of areas of concern about mold and mildew growth were identified, however, no visible mold growth was observed. Unrenovated classrooms appeared to have evidence of water damage. Several rooms in the renovated sections were also found to have water-damaged ceiling tiles. The main library area had numerous ceiling tiles stained or missing and appeared to be damaged by roof leaks. As previously noted, water leaks must be remedied to prevent future opportunities for mold growth.

Some of the GHS respondents (26% of students and 33% of teachers and school personnel) also reported unusual or unpleasant dust in the school building. Some reported that the locations near the construction site were very noisy. These situations may also lead to occupant discomfort and complaints.

The majority of the GHS respondents reported that their symptoms occurred most often or became worse in the following locations: the gymnasium, and classrooms 215, 101, 202 and 201. These locations, especially the gymnasium and classroom 215, were the ones most frequently cited with regard to environmental conditions: unpleasant dust, chemical odors, musty or moldy odors, other types of unpleasant odors, and stuffy air.

Despite possible opportunities for exposure to contaminants that may be off gassing from materials used in the construction of gymnasium floor, the prevalence rates of symptoms as well as reported diagnosed medical conditions among the student population were similar in the following

three groups: those who reported that they had not spent any time at the gymnasium in the last four weeks, those who reported spending less than five hours per week there in the last four weeks, and those who reported spending over five hours per week in the last four weeks. Therefore, although odors have been noted and remedial measures recommended, it would appear that those who used the gymnasium for various amounts of time during the mid-winter months did not experience any difference with regard to frequency of symptoms that those who did not. It would be expected that opportunities for exposure to materials used in the gymnasium construction would have been lower during mid-winter than earlier in the school year and over time these would continue to decrease. It is possible that symptoms or adverse health impacts may have been experienced more frequently or severely during the post-construction period earlier in the school year.

Overall, while symptom prevalence rates were slightly higher compared to what would be expected in a population that had not experienced indoor air quality problems, the elevations seen are consistent with the irritant and odor conditions associated with construction activities throughout the school. Importantly, the more serious types of health effects that can be associated with construction material like isophorone diisocyanate did not appear to be evident during the time of this survey. It is possible that a few people with individual hypersensitivity may experience reactions. It is expected that if remedial measures previously recommended are implemented, opportunities for exposures will decrease, and overall symptom prevalence will reflect lower background rates.

CONCLUSIONS

Symptom prevalence rates in GHS were slightly higher compared to what would be expected in a population that had not experienced indoor air quality problems. The elevations seen are likely related to, among other factors, a combination of overall ventilation problems, construction-related chemicals/materials, subsequent discussion of these issues among survey participants, and to a lesser extent construction-related dust and noise.

The more serious types of health effects (e.g., asthma) that can be associated with construction-related chemicals (i.e., isophorone diisocyanate) did not appear to be unusual during the time of this survey. It is expected that if remedial measures previously recommended are implemented, overall symptom prevalence will decrease to conform with lower background rates.

RECOMMENDATIONS

1. Implement prior building recommendations (MDPH 1997).
2. Following completion of construction, a revisit should be done to assess indoor air quality in the school.
3. Continue medical support services until school is found to meet acceptable standards.
4. Consider repeat of symptom prevalence survey after full completion of all construction activities.

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TABLES

Table 1. Demographic Information of GHS Students

	Female	Male	Total
Total number of students who participated in the survey	419	380	799
Age (median, yrs)	16.0	16.0	16.0
Time at GHS (median, yrs)	1.6	1.6	1.6
Timing of symptoms experienced:			
Time of day:			
None	51.1	43.4	47.4
Predominantly in the morning	17.4	18.2	17.8
Predominantly in the afternoon	16.9	16.6	16.8
Did not answer	14.6	21.8	18.0
Day of week:			
None	71.6	61.6	66.8
Predominantly at the beginning of the week	6.4	8.2	7.3
Predominantly at the end of the week	4.3	5.3	4.8
Did not answer	17.7	25.0	21.2
Smoking Status:			
Never smoked	75.2	73.4	74.3
Used to smoke	14.1	11.3	12.8
Smoke	9.5	13.2	11.3
Did not answer	1.2	2.1	1.6
Courses were:			
Too difficult	9.5	12.4	10.9
About right	89.3	85.5	87.5
Did not answer	1.2	2.1	1.6
Homework assigned was:			
Too demanding	19.6	34.2	26.5
Manageable	79.5	64.5	72.3
Did not answer	1.0	1.3	1.1
Social pressure at school was:			
Intolerable	6.0	7.4	6.6
Tolerable	37.9	35.5	36.8
Not a problem	54.9	55.3	55.1
Did not answer	1.2	1.8	1.5
Hours in school building per week during the last 4 weeks (median)	30	30	30
Inside the school building during the last 4 weekends			
No	72.6	62.1	67.6
Yes	26.3	34.7	30.3
Did not answer	1.2	3.2	2.1

Table 2. Symptom Prevalence among Students at GHS

Symptom	Experienced at least once a week in the last 4 weeks (%)			Experienced at least once a week in the last 4 weeks, and gets better away from school (%)		
	Female (n=419)	Male (n=380)	Total (n=799)	Female (n=419)	Male (n=380)	Total (n=799)
Unusual tiredness, fatigue or drowsiness	59.2	50.8	55.2	40.1	32.1	36.3
Headache	53.0	31.8	42.9	43.2	25.8	34.9
Stuffy or running nose, or sinus congestion	49.6	42.9	46.4	25.8	22.9	24.4
Dry, itching, or irritated eyes	25.3	22.6	24.0	22.4	17.9	20.3
Cough	37.0	34.2	35.7	17.4	18.4	17.9
Dizziness or lightheadedness	27.4	20.3	24.0	20.8	14.2	17.6
Sneezing	32.9	27.6	30.4	19.1	15.5	17.4
Sore, hoarse, or dry throat	34.4	23.9	29.4	18.1	15.8	17.0
Difficulty remembering things or concentrating	27.0	29.2	28.0	13.4	11.8	12.6
Shortness of breath	23.6	15.3	19.6	15.8	8.2	12.1
Nausea or upset stomach	18.6	11.6	15.3	11.2	9.2	10.3
Wheezing	16.0	16.3	16.1	10.7	9.2	10.0
Skin irritation, dryness, redness or rash	27.4	19.7	23.8	9.5	10.0	9.8
Pain/stiffness in back, shoulder, or neck	31.3	22.6	27.2	8.6	8.7	8.6
Tightness across the chest	9.8	7.1	8.5	5.0	4.2	4.6
Constipation	1.7	2.6	2.1	0.7	1.8	1.3
Urinary tract problems	1.4	1.6	1.5	-	0.8	0.4

Table 3. Grouped Symptom Prevalence among Students at GHS

	Symptoms experienced at least once a week in the last 4 weeks and get better away from school (%)		
	Female (n=419)	Male (n=380)	Total (n=799)
Grouped Symptoms -- experienced any one symptom:			
Upper respiratory symptoms: sore or dry throat, stuffy or runny nose, sneezing	41.8	36.8	39.4
Respiratory symptoms: wheezing, chest tightness, cough, shortness of breath	30.8	26.8	28.9
Neurologic symptoms: headache, difficult remembering things, dizziness or lightheadedness, unusual tiredness or fatigue	63.7	48.4	56.4
Grouped Symptoms -- experienced at least three symptoms:			
Multiple respiratory symptoms: shortness of breath, cough, chest tightness, wheezing	4.8	2.4	3.6
Multiple neurologic symptoms: headache, difficult remembering things, dizziness or lightheadedness, unusual tiredness or fatigue	14.6	10.3	12.5
Multiple symptom group typically associated with indoor air quality complaints : dry or irritated eyes, sore or dry throat, stuffy or runny nose, unusual tiredness or fatigue, headache	23.6	16.1	20.0
Atopic: sneezing, nasal congestion, and eye irritation	3.3	3.7	3.5

Table 4. Reported Diagnosed Medical Conditions from GHS Students

	Prevalence Female (%)	Prevalence Male (%)	Prevalence Total (%)
Asthma	13.1	14.7	13.9
Eczema	6.7	2.1	4.5
Hayfever	7.2	6.3	6.8
Migraine	12.2	8.2	10.3

Table 5. Perceived Indoor Environment Conditions among Students at GHS

	Conditions experienced during the last 4 weeks Female (%)	Conditions experienced during the last 4 weeks Male (%)	Conditions experienced during the last 4 weeks Total (%)
Unusual or unpleasant dust	27.0	25.5	26.3
Vehicle exhaust odor	9.3	7.1	8.3
Musty or moldy odors	25.5	17.6	21.8
Chemical odors	37.0	30.5	33.9
Other unusual or unpleasant odors	27.2	22.9	25.2
Air too dry	47.3	34.2	41.1
Air too humid	21.7	16.1	19.0
Air too stuffy	48.9	33.9	41.8
Temperature too hot[1]	57.5	54.7	56.2
Temperature too cold[1]	24.3	14.2	19.5

Note: [1] Of all GHS students, 13.9% reported that the temperature varied from too hot to too cold; 42.3% reported that the temperature was too hot, and 5.6% reported that the temperature was too cold.

Table 6. Demographic Information of GHS Teachers and School Personnel

	Female	Male	Total
Total number of employees who participated in the survey	71	53	124
Age (median, yrs)	47.0	49.0	48.0
Years at GHS (median)	3.8	11.5	5.0
Timing of symptoms experienced:			
Time of day:			
None	38.0	49.1	42.7
Predominantly in the morning	25.4	15.1	21.0
Predominantly in the afternoon	18.3	15.1	16.9
Predominantly in the evening	-	-	-
Did not answer	18.3	20.8	19.4
Day of week:			
None	67.6	69.8	68.5
Predominantly at the beginning of the week	8.5	7.5	8.1
Predominantly at the end of the week	4.2	1.9	3.2
Predominantly on the weekend	-	-	-
Did not answer	19.7	20.8	20.2
Smoking Status:			
Never smoked	56.3	54.7	55.6
Used to smoke	35.2	26.4	31.5
Smoke	4.2	13.2	8.1
Did not answer	4.2	5.7	4.8
Work interesting or stimulating:			
Very much	69.0	58.5	64.5
Moderately	22.5	26.4	24.2
Slightly	2.8	11.3	6.5
Did not answer	5.6	3.8	4.8
Control of work load:			
Very much	62.0	47.2	55.6
Moderately	28.2	32.1	29.8
Slightly	5.6	17.0	10.5
Did not answer	4.2	3.8	4.0
Hours in school building per week during the last 4 weeks (median)	38	40	40
Hours in school building per week during the last 4 weekends (median)	0	0	0

Table 7. Symptom Prevalence among GHS Teachers and School Personnel

Symptom	Experienced at least once a week in the last 4 weeks (%)			Experienced at least once a week in the last 4 weeks, and gets better away from school (%)		
	Female (n=71)	Male (n=53)	Total (n=124)	Female (n=71)	Male (n=53)	Total (n=124)
Unusual tiredness, fatigue or drowsiness	47.9	32.1	41.1	33.8	24.5	29.8
Sore, hoarse, or dry throat	33.8	24.5	29.8	25.4	24.5	25.0
Stuffy or running nose, or sinus congestion	54.9	34.0	46.0	28.2	17.0	23.4
Dry, itching, or irritated eyes	31.0	30.2	30.6	22.5	20.8	21.8
Headache	36.6	11.3	25.8	28.2	7.5	19.4
Sneezing	26.8	11.3	20.2	16.9	9.4	13.7
Cough	22.5	20.8	21.8	14.1	11.3	12.9
Dizziness or lightheadedness	25.4	9.4	18.5	15.5	7.5	12.1
Skin irritation, dryness, redness or rash	32.4	13.2	24.2	12.7	3.8	8.9
Tightness across the chest	14.1	9.4	12.1	9.9	7.5	8.9
Shortness of breath	15.5	13.2	14.5	9.9	5.7	8.1
Difficulty remembering things or concentrating	12.7	13.2	12.9	8.5	7.5	8.1
Wheezing	14.1	3.8	9.7	11.3	-	6.5
Pain/stiffness in back, shoulder, or neck	26.8	20.8	24.2	7.0	3.8	5.6
Constipation	16.9	3.8	11.3	5.6	3.8	4.8
Nausea or upset stomach	8.5	-	4.8	5.6	-	3.2
Urinary tract problems	4.2	1.9	3.2	2.8	-	1.6

Table 8. Grouped Symptom Prevalence among GHS Teachers and School Personnel

	Symptoms experienced at least once a week in the last 4 weeks and get better away from work (%)		
	Female (n=73)	Male (n=53)	Total (n=124)
Grouped Symptoms -- experienced any one symptom:			
Upper respiratory symptoms: sore or dry throat, stuffy or runny nose, sneezing	43.7	35.8	40.3
Respiratory symptoms: wheezing, chest tightness, cough, shortness of breath	26.8	18.9	23.4
Neurologic symptoms: headache, difficult remembering things, dizziness or lightheadedness, unusual tiredness or fatigue	49.3	28.3	40.3
Grouped Symptoms -- experienced at least three symptoms:			
Multiple respiratory symptoms: shortness of breath, cough, chest tightness, wheezing	4.2	1.9	3.2
Multiple neurologic symptoms: headache, difficult remembering things, dizziness or lightheadedness, unusual tiredness or fatigue	7.0	3.8	5.6
Multiple symptom group typically associated with indoor air quality complaints: dry or irritated eyes, sore or dry throat, stuffy or runny nose, unusual tiredness or fatigue, headache	22.5	17.0	20.2
Atopic: sneezing, nasal congestion, and eye irritation	5.6	1.9	4.0

Table 9. Reported Diagnosed Medical Conditions from GHS Teachers and School Personnel

	Prevalence Female (%)	Prevalence Male (%)	Prevalence Total (%)
Asthma	14.1	9.4	12.1
Eczema	11.3	1.9	7.3
Hayfever	19.7	15.1	17.7
Migraine	14.1	3.8	9.7

Table 10. Perceived Indoor Environment Conditions among GHS Teachers and School Personnel

	Conditions experienced during the last 4 weeks Female (%)	Conditions experienced during the last 4 weeks Male (%)	Conditions experienced during the last 4 weeks Total (%)
Unusual or unpleasant dust	32.4	34.0	33.1
Vehicle exhaust odor	12.7	15.1	13.7
Musty or moldy odors	15.5	11.3	13.7
Chemical odors	39.4	34.0	37.1
Other unusual or unpleasant odors	38.0	26.4	33.1
Air too dry	5.6	1.9	4.0
Air too humid	5.6	1.9	4.0
Air too stuffy	62.0	41.5	53.2
Temperature too hot[1]	66.2	64.2	65.3
Temperature too cold[1]	28.2	13.2	21.8

Note: [1] Of all GHS teachers and school personnel, 16.1% reported that the temperature varied from too hot to too cold; 49.2% reported that the temperature was too hot, and 5.6% reported that the temperature was too cold.

Table 11. Symptom Prevalence and Time Spent in the Gymnasium among GHS Students

Symptom(s)[1]	Experienced at least once a week in the last 4 weeks, and gets better away from school (%)								
	No time spent in the gymnasium			Spent 5 hrs or less per week in the gymnasium			Spent more than 5 hrs per week in the gymnasium		
	Female (n = 161)	Male (n = 124)	Total (n = 285)	Female (n = 161)	Male (n = 137)	Total (n = 298)	Female (n = 97)	Male (n = 119)	Total (n = 216)
Dry, itching, or irritated eyes	22.4	14.5	18.9	19.3	22.6	20.8	27.8	16.0	21.3
Headache	42.9	29.0	36.8	41.6	25.5	34.2	46.4	22.7	33.3
Sore, hoarse, or dry throat	16.1	19.4	17.5	19.3	13.9	16.8	19.6	14.3	16.7
Unusual tiredness, fatigue, or drowsiness	41.0	29.8	36.1	38.5	32.1	35.6	41.2	34.5	37.5
Stuffy or runny nose, or sinus congestion	26.7	24.2	25.6	24.8	21.2	23.2	25.8	23.5	24.5
Coughing	16.8	20.2	18.2	17.4	19.7	18.5	18.6	15.1	16.7
Dizziness or lightheadedness	14.9	15.3	15.1	24.2	16.8	20.8	24.7	10.1	16.7
Sneezing	21.1	16.1	18.9	16.8	15.3	16.1	19.6	15.1	17.1

Note: [1] Only the most frequently reported symptoms by GHS students were included in the analysis.

Table 12. Grouped Symptom Prevalence and Time Spent in the Gymnasium among GHS Students

Symptom(s)	Experienced at least once a week in the last 4 weeks, and gets better away from school (%)								
	No time spent in the gymnasium			Spent 5 hrs or less per week in the gymnasium			Spent more than 5 hrs per week in the gymnasium		
	Female (n = 161)	Male (n = 124)	Total (n = 285)	Female (n = 161)	Male (n = 137)	Total (n = 298)	Female (n = 97)	Male (n = 119)	Total (n = 216)
Upper respiratory symptoms: sore or dry throat, stuffy or runny nose, sneezing (*any one of these*)	41.0	41.1	41.1	41.0	35.8	38.6	44.3	33.6	38.4
Respiratory symptoms: wheezing, chest tightness, cough, shortness of breath (*any one of these*)	27.3	27.4	27.4	29.2	27.7	28.5	39.2	25.2	31.5
Neurologic symptoms: headache, difficult remembering things, dizziness or lightheadedness, unusual tiredness or fatigue (*any one of these*)	63.4	48.4	56.8	64.6	48.2	57.0	62.9	48.7	55.1
Multiple respiratory symptoms: shortness of breath, cough, chest tightness, wheezing (*any three of these*)	4.3	1.6	3.2	5.0	2.2	3.7	5.2	3.4	4.2
Multiple neurologic symptoms: headache, difficult remembering things, dizziness or lightheadedness, unusual tiredness or fatigue (*any three of these*)	13.0	11.3	12.3	14.3	11.7	13.1	17.5	7.6	12.0
The multiple symptom group typically associated with indoor air quality complaints : dry or irritated eyes, sore or dry throat, stuffy or runny nose, unusual tiredness or fatigue, headache (*any three of these*)	24.2	16.1	20.7	23.6	16.8	20.5	22.7	15.1	18.5
Atopic: sneezing, nasal congestion, and eye irritation (*all three*)	3.7	3.2	3.5	3.1	3.6	3.4	3.1	4.2	3.7

Table 13. Prevalence of Reported Diagnosed Medical Conditions and Time Spent in the Gymnasium among GHS Students

Medical Conditions	No time spent in the gymnasium			Spent 5 hrs or less per week in the gymnasium			Spent more than 5 hrs per week in the gymnasium		
	Female (n = 161)	Male (n = 124)	Total (n = 285)	Female (n = 161)	Male (n = 137)	Total (n = 298)	Female (n = 97)	Male (n = 119)	Total (n = 216)
Asthma	14.3	17.7	15.8	11.8	14.6	13.1	13.4	11.8	12.5
Eczema	6.8	1.6	4.6	5.0	2.2	3.7	9.3	2.5	5.6
Hayfever	6.2	5.6	6.0	6.8	8.8	7.7	9.3	4.2	6.5
Migraine	11.8	8.9	10.5	13.0	8.0	10.7	11.3	7.6	9.3

Table 14. Perceived Indoor Environmental Conditions and Locations in GHS

Perceived Indoor Environmental Conditions in GHS	Top 5 Rooms/Areas Reported by GHS Students	Top 5 Rooms/Areas Reported by GHS Teachers and School Personnel
Unusual or Unpleasant Dust	Hallways, Gymnasium, 101, 215, 102	Hallways, 204, 209, 317, 3rd floor
Vehicle Exhaust Odor	Gymnasium, Vocational, Hallways, 101, 201	Cafeteria, 1st floor, Nursery
Musty or Moldy Odors	215, Gymnasium, Hallways, 107, 101	Hallways, 1st floor, 3rd floor
Chemical Odors	Gymnasium, 3105, Hallways, 215, 3111	Gymnasium, 3rd floor, Hallways, Main Office, 319
Other Unusual or Unpleasant Odors	Gymnasium, 215, Hallways, 107, 101	Gymnasium, Hallways, 3rd floor, 215, 2202
Air too Dry	Gymnasium, 217, 202, 107, 215	Main Office, Library, 315, 2301, 311
Air too Humid	2202, 317, 202, 215, 217	202, 330, 3rd Floor, Kitchen, Nursery
Air too Stuffy	Gymnasium, 2202, 2204, 202, 215	Main Office, Cafeteria, Library, 1208, 319
Temperature too Hot	319, 215, 217, 202, 2202	2301, 319, 204, 315, 105
Temperature too Cold	101, Lecture Hall, 202, Vocational, 206	Lecture Hall, 101, 201, 202, Auditorium

Table 15. Demographic Information of Students in the Comparison High School

	Female	Male	Total
Total number of students who participated in the survey	126	118	244
Age (median, yrs)	16.0	17.0	16.0
Time at PVMHS (median, yrs)	3.7	3.7	3.7
Timing of symptoms experienced:			
Time of day:			
None	67.5	51.7	59.8
Predominantly in the morning	9.5	15.3	12.3
Predominantly in the afternoon	6.3	4.2	5.3
Did not answer	16.7	28.8	22.5
Day of week:			
None	73.0	61.0	67.2
Predominantly at the beginning of the week	5.6	4.2	4.9
Predominantly at the end of the week	0.8	1.7	1.2
Did not answer	20.6	33.1	26.6
Smoking Status:			
Never smoked	57.1	58.5	57.8
Used to smoke	23.0	13.6	18.4
Smoke	19.0	25.4	22.1
Did not answer	0.8	2.5	1.6
Courses were:			
Too difficult	10.3	9.3	9.8
About right	88.9	86.4	87.7
Did not answer	0.8	4.2	2.5
Homework assigned was:			
Too demanding	19.0	23.7	21.3
Manageable	80.2	72.9	76.6
Did not answer	0.8	3.4	2.0
Social pressure at school was:			
Intolerable	14.3	14.4	14.3
Tolerable	32.5	25.4	29.1
Not a problem	52.4	55.9	54.1
Did not answer	0.8	4.2	2.5
Hours in school building per week during the last 4 weeks (median)	32	30	30
Inside the school building during the last 4 weekends			
No	88.1	72.9	80.7
Yes	2.4	5.1	3.7
Did not answer	9.5	22.0	15.6

Table 16. Symptom Prevalence among Students in the Comparison High School

Symptom	Experienced at least once a week in the last 4 weeks (%)			Experienced at least once a week in the last 4 weeks, and gets better away from school (%)		
	Female (n=126)	Male (n=118)	Total (n=244)	Female (n=126)	Male (n=118)	Total (n=244)
Unusual tiredness, fatigue or drowsiness	43.7	41.5	42.6	27.0	30.5	28.7
Headache	41.3	23.7	32.8	15.9	14.4	15.2
Pain/stiffness in back, shoulder, or neck	28.6	27.1	27.9	7.1	12.7	9.8
Difficulty remembering things or concentrating	31.0	30.5	30.7	7.9	11.0	9.4
Stuffy or running nose, or sinus congestion	31.0	28.0	29.5	4.8	14.4	9.4
Cough	26.2	28.0	27.0	6.3	11.9	9.0
Sneezing	24.6	20.3	22.5	8.7	9.3	9.0
Dry, itching, or irritated eyes	16.7	17.8	17.2	6.3	11.0	8.6
Nausea or upset stomach	15.1	12.7	13.9	7.9	9.3	8.6
Sore, hoarse, or dry throat	15.1	16.9	16.0	7.1	9.3	8.2
Dizziness or lightheadedness	18.3	10.2	14.3	7.9	7.6	7.8
Shortness of breath	15.1	11.0	13.1	5.6	4.2	4.9
Wheezing	18.3	16.9	17.6	3.2	3.4	3.3
Skin irritation, dryness, redness or rash	18.3	12.7	15.6	0.8	5.1	2.9
Tightness across the chest	4.0	5.9	4.9	-	4.2	2.0
Urinary tract problems	1.6	5.1	3.3	0.8	2.5	1.6
Constipation	0.8	5.1	2.9	-	3.4	1.6

Table 17. Grouped Symptom Prevalence among Students in the Comparison High School

	Symptoms experienced at least once a week in the last 4 weeks and get better away from school (%)		
	Female (n=126)	Male (n=118)	Total (n=244)
Grouped Symptoms -- experienced any one symptom:			
Upper respiratory symptoms: sore or dry throat, stuffy or runny nose, sneezing	16.7	20.3	18.4
Respiratory symptoms: wheezing, chest tightness, cough, shortness of breath	12.7	15.3	13.9
Neurologic symptoms: headache, difficult remembering things, dizziness or lightheadedness, unusual tiredness or fatigue	38.9	38.1	38.5
Grouped Symptoms -- experienced at least three symptoms:			
Multiple respiratory symptoms: shortness of breath, cough, chest tightness, wheezing	0.8	2.5	1.6
Multiple neurologic symptoms: headache, difficult remembering things, dizziness or lightheadedness, unusual tiredness or fatigue	4.8	6.8	5.7
Multiple symptom group typically associated with indoor air quality complaints : dry or irritated eyes, sore or dry throat, stuffy or runny nose, unusual tiredness or fatigue, headache	4.0	6.8	5.3
Atopic: sneezing, nasal congestion, and eye irritation	1.6	4.2	2.9

Table 18. Reported Diagnosed Medical Conditions among Students in the Comparison High School

	Prevalence Female (%)	Prevalence Male (%)	Prevalence Total (%)
Asthma	27.8	11.9	20.1
Eczema	8.7	3.4	6.1
Hayfever	11.9	6.8	9.4
Migraine	16.7	6.8	11.9

Table 19. Perceived Indoor Environment Conditions among Students in the Comparison High School

	Conditions experienced during the last 4 weeks Female (%)	Conditions experienced during the last 4 weeks Male (%)	Conditions experienced during the last 4 weeks Total (%)
Unusual or unpleasant dust	32.5	25.4	29.1
Vehicle exhaust odor	9.5	12.7	11.1
Musty or moldy odors	42.1	31.4	36.9
Chemical odors	43.7	33.1	38.5
Other unusual or unpleasant odors	52.4	46.6	49.6
Air too dry	39.7	32.2	36.1
Air too humid	28.6	22.9	25.8
Air too stuffy	69.8	43.2	57.0
Temperature too hot[1]	61.9	59.3	60.7
Temperature too cold[1]	42.9	39.0	41.0

Note: [1] Of all the students in the comparison high school, 27.0% reported that the temperature varied from too hot to too cold; 33.6% reported that the temperature was too hot, and 13.9% reported that the temperature was too cold.

Table 20. Demographic Information of Teachers and School personnel in the Comparison High School

	Female	Male	Total
Total number of employees who participated in the survey	22	25	47
Age (median, yrs)	44.5	50.0	49.0
Years at PVMHS (median)	4.8	13.0	11.0
Timing of symptoms experienced:			
Time of day:			
None	45.5	44.0	44.7
Predominantly in the morning	-	12.0	6.4
Predominantly in the afternoon	9.1	12.0	10.6
Predominantly in the evening	-	4.0	2.1
Did not answer	45.5	28.0	36.2
Day of week:			
None	59.1	56.0	57.4
Predominantly at the beginning of the week	-	4.0	2.1
Predominantly at the end of the week	-	4.0	2.1
Predominantly on the weekend	-	-	-
Did not answer	40.9	36.0	38.3
Smoking Status:			
Never smoked	59.1	48.0	53.2
Used to smoke	31.8	28.0	29.8
Smoke	4.5	16.0	10.6
Did not answer	4.5	8.0	6.4
Work interesting or stimulating:			
Very much	50.0	44.0	46.8
Moderately	36.4	40.0	38.3
Slightly	9.1	12.0	10.6
Did not answer	4.5	4.0	4.3
Control of work load:			
Very much	45.5	40.0	42.6
Moderately	36.4	28.0	31.9
Slightly	13.6	28.0	21.3
Did not answer	4.5	4.0	4.3
Hours in school building per week during the last 4 weeks (median)	37.3	38.0	38.0
Hours in school building per week during the last 4 weekends (median)	0	0	0

Table 21. Symptom Prevalence among Teachers and School personnel in the Comparison High School

Symptom	Experienced at least once a week in the last 4 weeks (%)			Experienced at least once a week in the last 4 weeks, and gets better away from school (%)		
	Female (n=22)	Male (n=25)	Total (n=47)	Female (n=22)	Male (n=25)	Total (n=47)
Stuffy or running nose, or sinus congestion	31.8	24.0	27.7	9.1	8.0	8.5
Sore, hoarse, or dry throat	4.5	24.0	14.9	-	16.0	8.5
Unusual tiredness, fatigue or drowsiness	18.2	20.0	19.1	4.5	8.0	6.4
Cough	9.1	24.0	17.0	-	12.0	6.4
Headache	4.5	20.0	12.8	-	12.0	6.4
Pain/stiffness in back, shoulder, or neck	4.5	24.0	14.9	-	8.0	4.3
Wheezing	4.5	20.0	12.8	-	8.0	4.3
Shortness of breath	-	16.0	8.5	-	8.0	4.3
Tightness across the chest	-	12.0	6.4	-	8.0	4.3
Dry, itching, or irritated eyes	-	12.0	6.4	-	4.0	2.1
Skin irritation, dryness, redness or rash	4.5	8.0	6.4	-	4.0	2.1
Sneezing	-	12.0	6.4	-	4.0	2.1
Dizziness or lightheadedness	4.5	4.0	4.3	-	4.0	2.1
Difficulty remembering things or concentrating	-	8.0	4.3	-	4.0	2.1
Constipation	4.5	-	2.1	-	-	-
Nausea or upset stomach	-	-	-	-	-	-
Urinary tract problems	-	-	-	-	-	-

Table 22. Grouped Symptom Prevalence among Teachers and School personnel in the Comparison High School

	Symptoms experienced at least once a week in the last 4 weeks and get better away from work (%)		
	Female (n=22)	Male (n=25)	Total (n=47)
Grouped Symptoms -- experienced any one symptom:			
Upper respiratory symptoms: sore or dry throat, stuffy or runny nose, sneezing	9.1	16.0	12.8
Respiratory symptoms: wheezing, chest tightness, cough, shortness of breath	-	12.0	6.4
Neurologic symptoms: headache, difficult remembering things, dizziness or lightheadedness, unusual tiredness or fatigue	4.5	20.0	12.8
Grouped Symptoms -- experienced at least three symptoms:			
Multiple respiratory symptoms: shortness of breath, cough, chest tightness, wheezing	-	8.0	4.3
Multiple neurologic symptoms: headache, difficult remembering things, dizziness or lightheadedness, unusual tiredness or fatigue	-	4.0	2.1
Multiple symptom group typically associated with indoor air quality complaints: dry or irritated eyes, sore or dry throat, stuffy or runny nose, unusual tiredness or fatigue, headache	-	4.0	2.1
Atopic: sneezing, nasal congestion, and eye irritation	-	4.0	2.1

Table 23. Reported Diagnosed Medical Conditions from Teachers and School personnel in the Comparison High School

	Prevalence Female (%)	Prevalence Male (%)	Prevalence Total (%)
Asthma	9.1	12.0	10.6
Eczema	13.6	8.0	10.6
Hayfever	9.1	32.0	21.3
Migraine	27.3	4.0	14.9

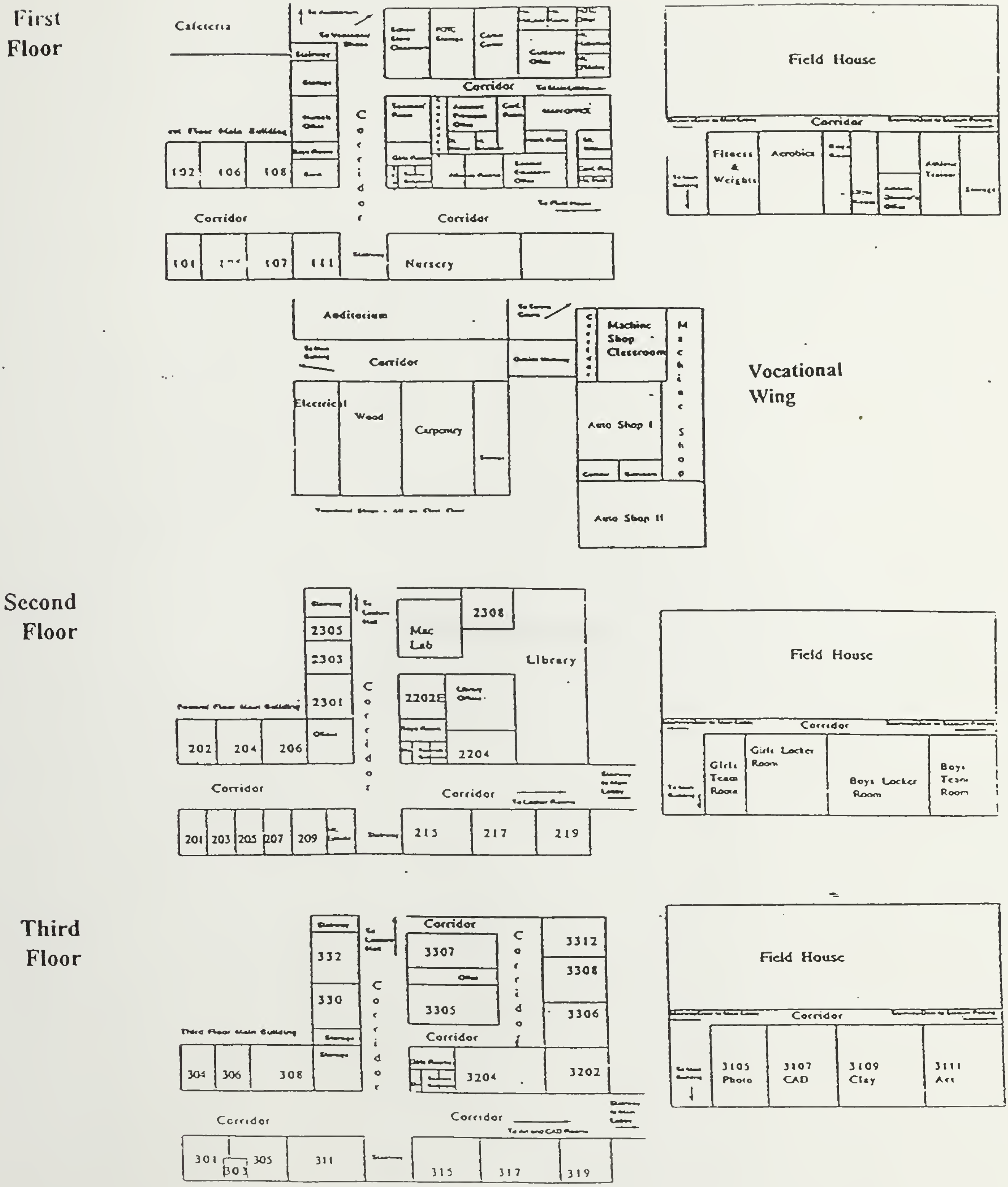
Table 24. Perceived Indoor Environment Conditions among Teachers and School personnel in the Comparison High School

	Conditions experienced during the last 4 weeks Female (%)	Conditions experienced during the last 4 weeks Male (%)	Conditions experienced during the last 4 weeks Total (%)
Unusual or unpleasant dust	27.3	24.0	25.5
Vehicle exhaust odor	4.5	16.0	10.6
Musty or moldy odors	18.2	28.0	23.4
Chemical odors	36.4	36.0	36.2
Other unusual or unpleasant odors	31.8	36.0	34.0
Air too dry	45.5	40.0	42.6
Air too humid	-	4.0	2.1
Air too stuffy	54.5	48.0	51.1
Temperature too hot[1]	63.6	44.0	53.2
Temperature too cold[1]	27.3	36.0	31.9

Note: [1] Of all the teachers and school personnel in the comparison high school, 27.7% reported that the temperature varied from too hot to too cold; 25.5% reported that the temperature was too hot, and 4.3% reported that the temperature was too cold..

FIGURE

Gloucester High School Floor Plans


First Floor
Cafeteria
Corridor
Field House
Fitness & Weights
Aerobics
102
106
108
101
107
111
Nursery
Auditorium
Machine Shop Classroom
Machine Shop
Electrical
Wood
Carpentry
Auto Shop I
Auto Shop II
Vocational Wing
Second Floor
2305
2303
2301
2308
Mac Lab
Library
2202E
2204
202
204
206
201
203
205
207
209
215
217
219
Girls Team Room
Girls Locker Room
Boys Locker Room
Boys Team Room
Third Floor
332
330
3307
3305
3312
3308
3306
3204
3202
304
306
308
301
303
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311
315
317
319
3105 Photo
3107 CAD
3109 Clay
3111 Art

Figure 1. Building Layout: Gloucester High School

APPENDICES

Appendix A

Massachusetts Department of Public Health
Bureau of Environmental Health Assessment
Symptom Prevalence Survey
(For Students Only)

ID ☐☐☐☐☐

MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH
BUREAU OF ENVIRONMENTAL HEALTH ASSESSMENT

SYMPTOM PREVALENCE SURVEY

(For Student Only)

The Bureau of Environmental Health Assessment (BEHA) in the Massachusetts Department of Public Health (MDPH) is conducting this survey in an effort to establish information regarding indoor air quality in this building and how it may relate to your health and comfort.

Your participation is voluntary but is very important. The higher the participation rate, the more representative the results will be. Early in the week of March 3, 1997, MDPH and Gloucester High School distributed information to all students to give to their parents or guardians about this survey notifying them of their right to refuse to have their child participate. Unless your parent or guardian has told you not to participate in this survey, please complete the attached questionnaire, place and seal it in the accompanying envelope, and return it to your homeroom teacher (or School Department staff in the case of those who are absent on the day of the survey). All responses will be analyzed independently by MDPH in Boston and kept confidential under the provisions of Massachusetts General Laws, Chapter 111, Section 24a. **In addition, no one other than authorized MDPH personnel will have access to any of the information collected.**

YOUR FULL NAME (Please Print): ______________________

YOUR HOMEROOM NUMBER (Please Print): __________

YOUR HOMEROOM TEACHER's NAME(Please Print): ______________________

THANK YOU FOR YOUR PARTICIPATION IN THIS STUDY.

ID

PLEASE DO NOT WRITE IN THIS COLUMN.

Please circle the number or fill in the blank that corresponds to the appropriate answer. Choose ONE answer unless instructed otherwise.

1. Are you

1. Female
2. Male

2a. How old are you?

_______ years

2b. What is your current grade?

_____th grade

3. How many total school years have you been at Gloucester High School?

_______ years _______ months

4a. During the *LAST 4 WEEKS AT SCHOOL,* have you experienced dry, itching, or irritated eyes?

1. No (If NO, skip to question 5a)
2. Yes, 1-3 days in the last 4 weeks
3. Yes, 1-3 days per week in the last 4 weeks
4. Yes, every or almost every day

4b. What happened to this symptom when you were away from school? (for example, holidays, weekends)

1. Got worse
2. Stayed the same
3. Got better

5a. During the *LAST 4 WEEKS AT SCHOOL,* have you experienced wheezing in your chest?

1. No (If NO, skip to question 6a)
2. Yes, 1-3 days in the last 4 weeks
3. Yes, 1-3 days per week in the last 4 weeks
4. Yes, every or almost every day

5b. What happened to this symptom when you were away from school? (for example, holidays, weekends)

1. Got worse
2. Stayed the same
3. Got better

ID ☐☐☐☐☐

PLEASE DO NOT WRITE IN THIS COLUMN.

6a. During the *LAST 4 WEEKS AT SCHOOL,* have you experienced headache?

1. No (If NO, skip to question 7a)
2. Yes, 1-3 days in the last 4 weeks
3. Yes, 1-3 days per week in the last 4 weeks
4. Yes, every or almost every day

6a ☐

6b. What happened to this symptom when you were away from school? (for example, holidays, weekends)

1. Got worse
2. Stayed the same
3. Got better

6b ☐

7a. During the *LAST 4 WEEKS ON SCHOOL DAYS,* have you experienced constipation (difficult, incomplete, or infrequent evacuation of the bowels)?

1. No (If NO, skip to question 8a)
2. Yes, 1-3 days in the last 4 weeks
3. Yes, 1-3 days per week in the last 4 weeks
4. Yes, every or almost every day

7a ☐

7b. What happened to this symptom on days that were not school days? (for example, holidays, weekends)

1. Got worse
2. Stayed the same
3. Got better

7b ☐

8a. During the *LAST 4 WEEKS AT SCHOOL,* have you experienced sore, hoarse, or dry throat?

1. No (If NO, skip to question 9a)
2. Yes, 1-3 days in the last 4 weeks
3. Yes, 1-3 days per week in the last 4 weeks
4. Yes, every or almost every day

8a ☐

8b. What happened to this symptom when you were away from school? (for example, holidays, weekends)

1. Got worse
2. Stayed the same
3. Got better

8b ☐

ID ☐☐☐☐☐

PLEASE DO NOT WRITE IN THIS COLUMN.

9a. During the *LAST 4 WEEKS AT SCHOOL*, have you experienced unusual tiredness, fatigue, or drowsiness?

1. No (If NO, skip to question 10a)
2. Yes, 1-3 days in the last 4 weeks
3. Yes, 1-3 days per week in the last 4 weeks
4. Yes, every or almost every day

9a ☐

9b. What happened to this symptom when you were away from school? (for example, holidays, weekends)

1. Got worse
2. Stayed the same
3. Got better

9b ☐

10a. During the *LAST 4 WEEKS AT SCHOOL*, have you experienced tightness across the chest?

1. No (If NO, skip to question 11a)
2. Yes, 1-3 days in the last 4 weeks
3. Yes, 1-3 days per week in the last 4 weeks
4. Yes, every or almost every day

10a ☐

10b. What happened to this symptom when you were away from school? (for example, holidays, weekends)

1. Got worse
2. Stayed the same
3. Got better

10b ☐

11a. During the *LAST 4 WEEKS AT SCHOOL*, have you experienced stuffy or runny nose, or sinus congestion?

1. No (If NO, skip to question 12a)
2. Yes, 1-3 days in the last 4 weeks
3. Yes, 1-3 days per week in the last 4 weeks
4. Yes, every or almost every day

11a ☐

11b. What happened to this symptom when you were away from school? (for example, holidays, weekends)

1. Got worse
2. Stayed the same
3. Got better

11b ☐

ID ☐☐☐☐☐

PLEASE DO NOT WRITE IN THIS COLUMN.

12a. During the *LAST 4 WEEKS ON SCHOOL DAYS,* have you experienced difficulty with urination or other related problems?

1. No (If NO, skip to question 13a)
2. Yes, 1-3 days in the last 4 weeks
3. Yes, 1-3 days per week in the last 4 weeks
4. Yes, every or almost every day

12a ☐

12b. What happened to this symptom on days that were not school days? (for example, holidays, weekends)

1. Got worse
2. Stayed the same
3. Got better

12b ☐

13a. During the *LAST 4 WEEKS AT SCHOOL,* have you experienced coughing?

1. No (If NO, skip to question 14a)
2. Yes, 1-3 days in the last 4 weeks
3. Yes, 1-3 days per week in the last 4 weeks
4. Yes, every or almost every day

13a ☐

13b. What happened to this symptom when you were away from school? (for example, holidays, weekends)

1. Got worse
2. Stayed the same
3. Got better

13b ☐

14a. During the *LAST 4 WEEKS AT SCHOOL,* have you experienced difficulty remembering things or concentrating?

1. No (If NO, skip to question 15a)
2. Yes, 1-3 days in the last 4 weeks
3. Yes, 1-3 days per week in the last 4 weeks
4. Yes, every or almost every day

14a ☐

14b. What happened to this symptom when you were away from school? (for example, holidays, weekends)

1. Got worse
2. Stayed the same
3. Got better

14b ☐

ID ☐☐☐☐☐

PLEASE DO NOT WRITE
IN THIS COLUMN.

15a. During the *LAST 4 WEEKS AT SCHOOL,* have you experienced pain or stiffness in back, shoulder, or neck?

1. No (If NO, skip to question 16a)
2. Yes, 1-3 days in the last 4 weeks
3. Yes, 1-3 days per week in the last 4 weeks
4. Yes, every or almost every day

15a ☐

15b. What happened to this symptom when you were away from school? (for example, holidays, weekends)

1. Got worse
2. Stayed the same
3. Got better

15b ☐

16a. During the *LAST 4 WEEKS AT SCHOOL,* have you experienced dizziness or lightheadedness?

1. No (If NO, skip to question 17a)
2. Yes, 1-3 days in the last 4 weeks
3. Yes, 1-3 days per week in the last 4 weeks
4. Yes, every or almost every day

16a ☐

16b. What happened to this symptom when you were away from school? (for example, holidays, weekends)

1. Got worse
2. Stayed the same
3. Got better

16b ☐

17a. During the *LAST 4 WEEKS AT SCHOOL,* have you experienced nausea or upset stomach?

1. No (If NO, skip to question 18a)
2. Yes, 1-3 days in the last 4 weeks
3. Yes, 1-3 days per week in the last 4 weeks
4. Yes, every or almost every day

17a ☐

17b. What happened to this symptom when you were away from school? (for example, holidays, weekends)

1. Got worse
2. Stayed the same
3. Got better

17b ☐

ID ☐☐☐☐☐

PLEASE DO NOT WRITE IN THIS COLUMN.

18a. During the *LAST 4 WEEKS AT SCHOOL,* have you experienced shortness of breath?

1. No (If NO, skip to question 19a)
2. Yes, 1-3 days in the last 4 weeks
3. Yes, 1-3 days per week in the last 4 weeks
4. Yes, every or almost every day

18a ☐

18b. What happened to this symptom when you were away from school? (for example, holidays, weekends)

1. Got worse
2. Stayed the same
3. Got better

18b ☐

19a. During the *LAST 4 WEEKS AT SCHOOL,* have you experienced skin irritation, dryness, redness or rash?

1. No (If NO, skip to question 20a)
2. Yes, 1-3 days in the last 4 weeks
3. Yes, 1-3 days per week in the last 4 weeks
4. Yes, every or almost every day

19a ☐

19b. What happened to this symptom when you were away from school? (for example, holidays, weekends)

1. Got worse
2. Stayed the same
3. Got better

19b ☐

20a. During the *LAST 4 WEEKS AT SCHOOL,* have you experienced sneezing?

1. No (If NO, skip to question 21a)
2. Yes, 1-3 days in the last 4 weeks
3. Yes, 1-3 days per week in the last 4 weeks
4. Yes, every or almost every day

20a ☐

20b. What happened to this symptom when you were away from school? (for example, holidays, weekends)

1. Got worse
2. Stayed the same
3. Got better

20b ☐

ID ☐☐☐☐☐

PLEASE DO NOT WRITE IN THIS COLUMN.

21a. If you have experienced any of the symptoms in the above questions, are there any specific locations in the school building where your symptoms occur most often or are worse? (If you have NOT had any symptoms during the *LAST 4 WEEKS,* skip to question 24.)

1. No (If NO, skip to question 22)
2. Yes

21a ☐

21b1 ☐☐☐☐

21b. If YES, at which location(s) or during which class(es) do your symptoms occur most often or are worse? (Please look over the example we have given below and then fill out the blank chart beneath it with your own personal information.)

EXAMPLE

	Room Number (if Known)	If a classroom, Teacher	Period	Class Name	If not a classroom, Name of Location (gym, cafeteria, biology lab, etc.)
Location 1	101	Ms. Case	1	Algebra	
Location 2	102	Mr. Ware	4-7	Gym	
Location 3					Cafeteria

	Room Number (if Known)	If a classroom, Teacher	Period	Class Name	If not a classroom, Name of Location (gym, cafeteria, biology lab, etc.)
Location 1					
Location 2					
Location 3					

22. If you have experienced any of the symptoms in the above questions, have you noticed a pattern over the course of most days as to when your symptoms occur most often or are worse? (If you have NOT had any symptoms during the *LAST 4 WEEKS,* skip to question 24.)

1. No, there is no particular time of day
2. Yes, predominantly in the morning
3. Yes, predominantly in the afternoon

22 ☐

23. Regarding the symptoms you have experienced, have you noticed a pattern over the course of the week as to when your symptoms occur most often or are worse?

1. No, there is no particular time of the week
2. Yes, predominantly at the beginning of the week
3. Yes, predominantly at the end of the week

23 ☐

ID ☐☐☐☐☐

PLEASE DO NOT WRITE IN THIS COLUMN.

24. Do you smoke cigarettes?

1. I have never smoked
2. I used to smoke
3. I still smoke

24 ☐

25. Have you ever been told by a doctor that you have or had any of the following?

A. Asthma 1. No 2. Yes
IF YES, 1) when was it first diagnosed: ____/____ (month/year)
2) have you seen a doctor for this condition
in the last FOUR weeks: 1. No 2. Yes

25a ☐

B. Eczema 1. No 2. Yes
IF YES, 1) when was it first diagnosed: ____/____ (month/year)
2) have you seen a doctor for this condition
in the last FOUR weeks: 1. No 2. Yes

25b ☐

C. Hayfever 1. No 2. Yes
IF YES, 1) when was it first diagnosed: ____/____ (month/year)
2) have you seen a doctor for this condition
in the last FOUR weeks: 1. No 2. Yes

25c ☐

D. Migraine Headaches 1. No 2. Yes
IF YES, 1) when was it first diagnosed: ____/____ (month/year)
2) have you seen a doctor for this condition
in the last FOUR weeks: 1. No 2. Yes

25d ☐

26. During the *last 4 weeks*, have you had an acute illness (i.e., cold, ear infection, sinus infection, etc.) leading to any of the following symptoms?

A. Stuffy or runny nose, or sinus congestion	1. No	2. Yes	26a ☐
B. Sneezing	1. No	2. Yes	26b ☐
C. Sore or dry throat	1. No	2. Yes	26c ☐
D. Cough	1. No	2. Yes	26d ☐
E. Headache	1. No	2. Yes	26e ☐

27. Do you think that your courses are:

1. Too difficult
2. About right

27 ☐

28. Do you feel that the amount of homework assigned is:

1. Too demanding
2. Manageable

28 ☐

ID ☐☐☐☐☐

PLEASE DO NOT WRITE
IN THIS COLUMN.

29. Do you feel that the social pressure (cliques, etc.) at school is:

1. Intolerable
2. Tolerable
3. Not a problem

29 ☐

30a. During the *LAST 4 WEEKS,* what is the average number of hours *PER WEEK* you have actually been inside Gloucester High School?

________ hours/per week

30 ☐☐

30b. During the *LAST 4 WEEKS,* what is the average number of hours *PER WEEK* you have actually been inside the Field House in Gloucester High School, and for what activities (for example, basketball, physical education class, etc.)?

Activities	Hours Per Week

31. Have you been inside Gloucester High School during the *LAST 4 WEEKENDS*?

1. No
2. Yes

31 ☐

32. Please circle any of the following which you have experienced during the *LAST 4 WEEKS*:

32a. Unusual or unpleasant dusts 1. No 2. Yes

32a ☐

If YES, please identify any specific locations in the following chart:

		If a classroom,			If not a classroom,
	Room Number (if Known)	Teacher	Period	Class Name	Name of Location (gym, cafeteria, biology lab, etc.)
Location 1					
Location 2					
Location 3					

ID ☐☐☐☐☐

PLEASE DO NOT WRITE IN THIS COLUMN.

32b. Vehicle exhaust odor 1. No 2. Yes

32b ☐

If YES, please identify any specific locations in the following chart:

		If a classroom,			If not a classroom,
	Room Number (if Known)	Teacher	Period	Class Name	Name of Location (gym, cafeteria, biology lab, etc.)
Location 1					
Location 2					
Location 3					

32c. Musty or moldy odors 1. No 2. Yes

32c ☐

If YES, please identify any specific locations in the following chart:

		If a classroom,			If not a classroom,
	Room Number (if Known)	Teacher	Period	Class Name	Name of Location (gym, cafeteria, biology lab, etc.)
Location 1					
Location 2					
Location 3					

32d. Chemical odors (for example, paint, cleaning fluids, etc.) 1. No 2. Yes

32d ☐

If YES, please identify any specific locations in the following chart:

		If a classroom,			If not a classroom,
	Room Number (if Known)	Teacher	Period	Class Name	Name of Location (gym, cafeteria, biology lab, etc.)
Location 1					
Location 2					
Location 3					

32e. Other unusual or unpleasant odors 1. No 2. Yes

32e ☐

If YES, please identify any specific locations in the following chart:

		If a classroom,			If not a classroom,
	Room Number (if Known)	Teacher	Period	Class Name	Name of Location (gym, cafeteria, biology lab, etc.)
Location 1					
Location 2					
Location 3					

32f. Air too dry 1. No 2. Yes

32f ☐

If YES, please identify any specific locations in the following chart:

		If a classroom,			If not a classroom,
	Room Number (if Known)	Teacher	Period	Class Name	Name of Location (gym, cafeteria, biology lab, etc.)
Location 1					
Location 2					
Location 3					

ID ☐☐☐☐☐

PLEASE DO NOT WRITE IN THIS COLUMN.

32g. Air too humid 1. No 2. Yes

32g ☐

If YES, please identify any specific locations in the following chart:

	Room Number (if Known)	If a classroom,			If not a classroom,
		Teacher	Period	Class Name	Name of Location (gym, cafeteria, biology lab, etc.)
Location 1					
Location 2					
Location 3					

32h. Air too stuffy 1. No 2. Yes

32h ☐

If YES, please identify any specific locations in the following chart:

	Room Number (if Known)	If a classroom,			If not a classroom,
		Teacher	Period	Class Name	Name of Location (gym, cafeteria, biology lab, etc.)
Location 1					
Location 2					
Location 3					

32i. Temperature too hot 1. No 2. Yes

32i ☐

If YES, please identify any specific locations in the following chart:

	Room Number (if Known)	If a classroom,			If not a classroom,
		Teacher	Period	Class Name	Name of Location (gym, cafeteria, biology lab, etc.)
Location 1					
Location 2					
Location 3					

32j. Temperature too cold 1. No 2. Yes

32j ☐

If YES, please identify any specific locations in the following chart:

	Room Number (if Known)	If a classroom,			If not a classroom,
		Teacher	Period	Class Name	Name of Location (gym, cafeteria, biology lab, etc.)
Location 1					
Location 2					
Location 3					

ID ☐☐☐☐☐

PLEASE DO NOT WRITE IN THIS COLUMN.

33. Are there any other building or health related concerns at Gloucester High School?

____

____

____

____

____

34. Do you have any particular questions related to health or the indoor environment that you would like us to answer in a public health fact sheet?

____

____

Appendix B

Massachusetts Department of Public Health
Bureau of Environmental Health Assessment
Symptom Prevalence Survey
(For Teachers and School Personnel)

ID ☐☐☐☐☐

MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH
BUREAU OF ENVIRONMENTAL HEALTH ASSESSMENT

SYMPTOM PREVALENCE SURVEY

(For Teachers and School Personnel)

The Massachusetts Department of Public Health (MDPH) Bureau of Environmental Health Assessment (BEHA) is conducting this survey in an effort to establish information regarding indoor air quality in this building and how it may relate to your health and comfort.

Your participation is voluntary but is very important. The higher the participation rate, the more representative the results will be. Please complete the attached questionnaire, place and seal it in the accompanying envelope, and return it to the designated person. All responses will be analyzed independently by MDPH in Boston and kept confidential under the provisions of Massachusetts General Laws, Chapter 111, Section 24a. **In addition, no one other than authorized MDPH personnel will have access to any of the information collected.**

YOUR FULL NAME (Please Print): ____________________________

DO YOU TEACH AT SCHOOL (please check)? 1. Yes 2. No

IF YES, what subjects do you teach?

____

IF you do NOT teach, could you give your job title and the location where you generally work?

____

"BY COMPLETING THIS QUESTIONNAIRE, I INDICATE MY CONSENT TO PARTICIPATE IN THIS STUDY. I UNDERSTAND CONFIDENTIALITY WILL BE MAINTAINED."

THANK YOU FOR YOUR PARTICIPATION IN THIS STUDY.

ID ☐☐☐☐☐

PLEASE DO NOT WRITE IN THIS COLUMN.

6b. What happened to this symptom when you were away from work? (e.g., holidays, weekends)

1. Got worse
2. Stayed the same
3. Got better

6b ☐

7a. During the *LAST 4 WEEKS AT WORK,* have you experienced constipation?

1. No (If NO, skip to question 8a)
2. Yes, 1-3 days in the last 4 weeks
3. Yes, 1-3 days per week in the last 4 weeks
4. Yes, every or almost every day

7a ☐

7b. What happened to this symptom on days that were not working days? (e.g., holidays, weekends)

1. Got worse
2. Stayed the same
3. Got better

7b ☐

8a. During the *LAST 4 WEEKS AT WORK,* have you experienced sore, hoarse, or dry throat?

1. No (If NO, skip to question 9a)
2. Yes, 1-3 days in the last 4 weeks
3. Yes, 1-3 days per week in the last 4 weeks
4. Yes, every or almost every day

8a ☐

8b. What happened to this symptom when you were away from work? (e.g., holidays, weekends)

1. Got worse
2. Stayed the same
3. Got better

8b ☐

9a. During the *LAST 4 WEEKS AT WORK,* have you experienced unusual tiredness, fatigue, or drowsiness?

1. No (If NO, skip to question 10a)
2. Yes, 1-3 days in the last 4 weeks
3. Yes, 1-3 days per week in the last 4 weeks
4. Yes, every or almost every day

9a ☐

9b. What happened to this symptom when you were away from work? (e.g., holidays, weekends)

1. Got worse
2. Stayed the same
3. Got better

9b ☐

ID ☐☐☐☐☐

PLEASE DO NOT WRITE IN THIS COLUMN.

10a. During the *LAST 4 WEEKS AT WORK,* have you experienced tightness across the chest?

1. No (If NO, skip to question 11a)
2. Yes, 1-3 days in the last 4 weeks
3. Yes, 1-3 days per week in the last 4 weeks
4. Yes, every or almost every day

10a ☐

10b. What happened to this symptom when you were away from work? (e.g., holidays, weekends)

1. Got worse
2. Stayed the same
3. Got better

10b ☐

11a. During the *LAST 4 WEEKS AT WORK,* have you experienced stuffy or runny nose, or sinus congestion?

1. No (If NO, skip to question 12a)
2. Yes, 1-3 days in the last 4 weeks
3. Yes, 1-3 days per week in the last 4 weeks
4. Yes, every or almost every day

11a ☐

11b. What happened to this symptom when you were away from work? (e.g., holidays, weekends)

1. Got worse
2. Stayed the same
3. Got better

11b ☐

12a. During the *LAST 4 WEEKS AT WORK,* have you experienced urinary tract problems?

1. No (If NO, skip to question 13a)
2. Yes, 1-3 days in the last 4 weeks
3. Yes, 1-3 days per week in the last 4 weeks
4. Yes, every or almost every day

12a ☐

12b. What happened to this symptom on days that were not working days? (e.g., holidays, weekends)

1. Got worse
2. Stayed the same
3. Got better

12b ☐

13a. During the *LAST 4 WEEKS AT WORK,* have you experienced coughing?

1. No (If NO, skip to question 14a)
2. Yes, 1-3 days in the last 4 weeks
3. Yes, 1-3 days per week in the last 4 weeks
4. Yes, every or almost every day

13a ☐

ID ☐☐☐☐☐

PLEASE DO NOT WRITE IN THIS COLUMN.

13b. What happened to this symptom when you were away from work? (e.g., holidays, weekends)

1. Got worse
2. Stayed the same
3. Got better

13b ☐

14a. During the *LAST 4 WEEKS AT WORK,* have you experienced difficulty remembering things or concentrating?

1. No (If NO, skip to question 15a)
2. Yes, 1-3 days in the last 4 weeks
3. Yes, 1-3 days per week in the last 4 weeks
4. Yes, every or almost every day

14a ☐

14b. What happened to this symptom when you were away from work? (e.g., holidays, weekends)

1. Got worse
2. Stayed the same
3. Got better

14b ☐

15a. During the *LAST 4 WEEKS AT WORK,* have you experienced pain or stiffness in back, shoulder, or neck?

1. No (If NO, skip to question 16a)
2. Yes, 1-3 days in the last 4 weeks
3. Yes, 1-3 days per week in the last 4 weeks
4. Yes, every or almost every day

15a ☐

15b. What happened to this symptom when you were away from work? (e.g., holidays, weekends)

1. Got worse
2. Stayed the same
3. Got better

15b ☐

16a. During the *LAST 4 WEEKS AT WORK,* have you experienced dizziness or lightheadedness?

1. No (If NO, skip to question 17a)
2. Yes, 1-3 days in the last 4 weeks
3. Yes, 1-3 days per week in the last 4 weeks
4. Yes, every or almost every day

16a ☐

16b. What happened to this symptom when you were away from work? (e.g., holidays, weekends)

1. Got worse
2. Stayed the same
3. Got better

16b ☐

ID ☐☐☐☐☐

PLEASE DO NOT WRITE IN THIS COLUMN.

17a. During the *LAST 4 WEEKS AT WORK,* have you experienced nausea or upset stomach?

1. No (If NO, skip to question 18a)
2. Yes, 1-3 days in the last 4 weeks
3. Yes, 1-3 days per week in the last 4 weeks
4. Yes, every or almost every day

17a ☐

17b. What happened to this symptom when you were away from work? (e.g., holidays, weekends)

1. Got worse
2. Stayed the same
3. Got better

17b ☐

18a. During the *LAST 4 WEEKS AT WORK,* have you experienced shortness of breath?

1. No (If NO, skip to question 19a)
2. Yes, 1-3 days in the last 4 weeks
3. Yes, 1-3 days per week in the last 4 weeks
4. Yes, every or almost every day

18a ☐

18b. What happened to this symptom when you were away from work? (e.g., holidays, weekends)

1. Got worse
2. Stayed the same
3. Got better

18b ☐

19a. During the *LAST 4 WEEKS AT WORK,* have you experienced skin irritation, dryness, redness or rash?

1. No (If NO, skip to question 20a)
2. Yes, 1-3 days in the last 4 weeks
3. Yes, 1-3 days per week in the last 4 weeks
4. Yes, every or almost every day

19a ☐

19b. What happened to this symptom when you were away from work? (e.g., holidays, weekends)

1. Got worse
2. Stayed the same
3. Got better

19b ☐

20a. During the *LAST 4 WEEKS AT WORK,* have you experienced sneezing?

1. No (If NO, skip to question 21a)
2. Yes, 1-3 days in the last 4 weeks
3. Yes, 1-3 days per week in the last 4 weeks
4. Yes, every or almost every day

20a ☐

ID ☐☐☐☐☐

PLEASE DO NOT WRITE IN THIS COLUMN.

20b. What happened to this symptom when you were away from work? (e.g., holidays, weekends)

1. Got worse
2. Stayed the same
3. Got better

20b ☐

21a. If you have experienced any of the symptoms in the above questions, are there any specific locations in the school building where your symptoms occur most often or are worse? (If you have NOT had any symptoms during the *LAST 4 WEEKS,* skip to question 24.)

1. No (If NO, skip to question 22)
2. Yes

21a ☐

21b. If YES, at which location(s) do your symptoms occur most often or are worse? (Please look over the example we have given below and then fill out the blank chart beneath it with your own personal information.)

EXAMPLE

	Room Number or Name of Location	Comments
Location 1	101	
Location 2	Cafeteria	
Location 3		

	Room Number or Name of Location	Comments
Location 1		
Location 2		
Location 3		

22. If you have experienced any of the symptoms in the above questions, have you noticed a pattern during the day as to when your symptoms occur most often or are worse? (If you have NOT had any symptoms during the *LAST 4 WEEKS,* skip to question 24.)

1. No, there is no particular time of day
2. Yes, predominantly in the morning
3. Yes, predominantly in the afternoon
4. Yes, predominantly in the evening

22 ☐

ID ☐☐☐☐☐

PLEASE DO NOT WRITE IN THIS COLUMN.

23. If you have experienced any of the symptoms in the above questions, have you noticed a pattern over the course of a typical week as to when your symptoms occur most often or are worse?

1. No, there is no particular time of the week
2. Yes, predominantly at the beginning of the week
3. Yes, predominantly at the end of the week
4. Yes, predominantly on the weekend

23 ☐

24. What is your tobacco smoking status?

1. Never smoked
2. Former smoker
3. Current smoker

24 ☐

25. Have you ever been told by a doctor that you have or have had any of the following?

A. Asthma 1. No 2. Yes
IF YES, 1) when was it first diagnosed: _____/_____ (month/year)
2) have you seen a doctor for this condition **in the last FOUR weeks:** 1. No 2. Yes

25a ☐

B. Eczema 1. No 2. Yes
IF YES, 1) when was it first diagnosed: _____/_____ (month/year)
2) have you seen a doctor for this condition **in the last FOUR weeks:** 1. No 2. Yes

25b ☐

C. Hayfever 1. No 2. Yes
IF YES, 1) when was it first diagnosed: _____/_____ (month/year)
2) have you seen a doctor for this condition **in the last FOUR weeks:** 1. No 2. Yes

25c ☐

D. Migraine Headaches 1. No 2. Yes
IF YES, 1) when was it first diagnosed: _____/_____ (month/year)
2) have you seen a doctor for this condition **in the last FOUR weeks:** 1. No 2. Yes

25d ☐

26. During the *LAST 4 WEEKS*, have you had an acute illness (i.e., cold, ear infection, sinus infection, etc.) leading to any of the following symptoms?

A. Stuffy or runny nose, or sinus congestion	1. No	2. Yes	26a ☐
B. Sneezing	1. No	2. Yes	26b ☐
C. Sore or dry throat	1. No	2. Yes	26c ☐
D. Cough	1. No	2. Yes	26d ☐
E. Headache	1. No	2. Yes	26e ☐

ID ☐☐☐☐☐

PLEASE DO NOT WRITE IN THIS COLUMN.

27. Do you consider your work to be interesting or stimulating?

1. Very much
2. Moderately
3. Slightly

27 ☐

28. Do you feel you have control of your work load?

1. Very much/ often
2. Moderately/ sometimes
3. Slightly/ rarely

28 ☐

29. During the *LAST 4 WEEKS,* what is the average number of hours you worked *PER WEEK* actually inside this building?

________ hours/per week

29 ☐☐

30. Of the hours you worked in this building during the *LAST 4 WEEKS*, on an average, how many *PER WEEK* have been during the weekends (between 6 pm on Fridays through 6 am on Mondays)?

________ hours/per week

30 ☐☐

31. During the *LAST 4 WEEKS,* what is the average number of hours *PER WEEK* you have actually been inside the Field House in Gloucester High School, and for what activities (for example, basketball, physical education class, etc.)?

Activities	Hours Per Week
____________________	________
____________________	________
____________________	________
____________________	________

32. Please circle any of the following which you have experienced during the *LAST 4 WEEKS*:

32a. Unusual or unpleasant dusts 1. No 2. Yes

32a ☐

If YES, please identify any specific locations in the following chart:

	Room Number or Name of Location	Comments
Location 1		
Location 2		
Location 3		

ID ☐☐☐☐☐

PLEASE DO NOT WRITE IN THIS COLUMN.

32b. Vehicle exhaust odor 1. No 2. Yes

32b ☐

If YES, please identify any specific locations in the following chart:

	Room Number or Name of Location	Comments
Location 1		
Location 2		
Location 3		

32c. Musty or moldy odors 1. No 2. Yes

32c ☐

If YES, please identify any specific locations in the following chart:

	Room Number or Name of Location	Comments
Location 1		
Location 2		
Location 3		

32d. Chemical odors (for example, paint, cleaning fluids, etc.) 1. No 2. Yes

32d ☐

If YES, please identify any specific locations in the following chart:

	Room Number or Name of Location	Comments
Location 1		
Location 2		
Location 3		

32e. Other unusual or unpleasant odors 1. No 2. Yes

32e ☐

If YES, please identify any specific locations in the following chart:

	Room Number or Name of Location	Comments
Location 1		
Location 2		
Location 3		

32f. Air too dry 1. No 2. Yes

32f ☐

If YES, please identify any specific locations in the following chart:

	Room Number or Name of Location	Comments
Location 1		
Location 2		
Location 3		

ID ☐☐☐☐☐

PLEASE DO NOT WRITE IN THIS COLUMN.

32g. Air too humid 1. No 2. Yes 32g ☐

If YES, please identify any specific locations in the following chart:

	Room Number or Name of Location	Comments
Location 1		
Location 2		
Location 3		

32h. Air too stuffy 1. No 2. Yes 32h ☐

If YES, please identify any specific locations in the following chart:

	Room Number or Name of Location	Comments
Location 1		
Location 2		
Location 3		

32i. Temperature too hot 1. No 2. Yes 32i ☐

If YES, please identify any specific locations in the following chart:

	Room Number or Name of Location	Comments
Location 1		
Location 2		
Location 3		

32j. Temperature too cold 1. No 2. Yes 32j ☐

If YES, please identify any specific locations in the following chart:

	Room Number or Name of Location	Comments
Location 1		
Location 2		
Location 3		

ID ☐☐☐☐☐

PLEASE DO NOT WRITE IN THIS COLUMN.

33. Are there any other building or health related concerns at Gloucester High School?

____

____

____

____

____

34. Do you have any particular questions related to health or the indoor environment that you would like us to answer in a public health fact sheet?

____

____

Appendix C

Letter Sent to Parent or Guardian from Gloucester High School

Gloucester High School

Thomas Witham, M.Ed.
Principal
32 Leslie O. Johnson Road
Gloucester, MA 01930-2595

Telephone 508-281-9865
Fax 508-281-9733

March 3, 1997

Dear Parent or Guardian:

As you know, we have been actively working to address concerns that have been raised regarding indoor air quality and possible related health concerns at Gloucester High School.

We have asked the Massachusetts Department of Public Health to conduct a symptom prevalence survey to determine the extent to which the occupants are experiencing symptoms or discomfort.

The Massachusetts Department of Public Health will conduct this survey at the high school during the week of March 10.

Should you not wish to have your child participate in this survey, then you should contact the Principal's Office at 281-9865, or contact the Massachusetts Department of Public Health at 617-624-5757.

This survey is completely voluntary, but we would like to encourage as many individuals as possible to participate.

Sincerely,

Thomas Witham

Thomas Witham,
Principal

cc: Dr. Howard R. Goodrow
Superintendent of Schools

Appendix D

Correspondence

The Commonwealth of Massachusetts
Executive Office of Health and Human Services
Department of Public Health
250 Washington Street, Boston, MA 02108-4619

WILLIAM F. WELD
GOVERNOR

ARGEO PAUL CELLUCCI
LIEUTENANT GOVERNOR

JOSEPH GALLANT
SECRETARY

DAVID H. MULLIGAN
COMMISSIONER

February 13, 1997

Mr. Daniel Ottenheimer, Agent
Gloucester Health Department
22 Poplar Street
Gloucester, MA 01930

Mr. Thomas Witham, Principal
Gloucester High School
32 Leslie Johnson Road
Gloucester, MA 01930

Dear Mr. Ottenheimer and Mr Witham

As you know, the Massachusetts Department of Public Health (MDPH) Bureau of Environmental Health Assessment (BEHA) has been working with the Gloucester Health Department and Gloucester High School to address health and building-related concerns at Gloucester High School. We agree that concerns being expressed by parents and others need to be systematically addressed and resolved. As I described to you during our January meeting, in our experience the best way to do this is to take a step-wise approach.

The first step would be to complete a building wide inspection and assessment. The initial site visit for indoor air testing and inspection was done on February 7, 1997 by a team of BEHA technical staff. Completion of this piece of our evaluation at Gloucester High School has been scheduled for this Friday, February 14. Following this, we believe the next logical step is to implement a building-wide survey to the students, faculty and staff. This will help to better define problems, locations of concerns, and follow-up environmental investigations or supplementary testing, if needed. Through the survey MDPH will be able to systematically collect health related complaint information that is representative of the entire group of people who use the building. By asking everyone who attends or works at the school to complete this brief (15 to 20-minute) survey, we will be able to more completely help you respond to important concerns addressed by parents, students, and staff. Thank you for providing some information for the layout of the school. It would be important for us to have more detailed information regarding the location of construction activities and ventilation system design. We will give you a more precise estimate of when the survey could be conducted after we receive this additional information and have had a chance to review it and incorporate this information into our survey instrument

This survey will be directed and administered by MDPH staff and any information collected will be kept completely confidential and will be protected by Massachusetts General Laws Chapter 111, Section 24a. Any individual can choose either to participate or not to participate. We would of course, strongly encourage everyone to participate

because a higher response rate will greatly improve the quality of the survey results. In addition to the health related questions, we will also ask a few questions about the school environment as well as a question about any specific health or building related observations or comments that the person filling out the survey would like to tell us about.

We would like to implement the student portion of the survey by having homeroom teachers distribute questionnaires. After completing the survey, students would put the survey in a sealed envelope. The homeroom teachers would then collect the completed surveys and return them to MDPH staff who will be on-site. Instructions will be provided to the teachers regarding questions that may arise. All responses collected at the school will be brought back to our office in Boston on the same day as the survey is administered. Following this, survey responses will be coded, data entered, and proofed (by double data entry). Finally the data will be statistically analyzed, interpreted along with the building assessment information, and a report of findings produced.

We feel it is important that the School Department notify parents about their child's participation in the survey prior to its initiation. This can be a notice sent home with the students and notice to the local newspaper. Often schools we have been involved with have attached a copy of a letter similar to this one for information purposes. For children under age of 18 who are not emancipated minors, parents or guardians can refuse to have their child participate in this survey if they so desire. If parents or guardians have any questions or concerns about their child's participation, or if they do not want have their child participate in the survey, they should contact Dr. Zi Zhang or me at (617) 624-5757. Participation is completely voluntary, but very important to us.

Thank you for your cooperation and assistance in addressing these important concerns.

Sincerely,

Elaine T. Krueger

Elaine T. Krueger, M.P.H., Chief
Environmental Toxicology Program, BEHA

cc: Suzanne K. Condon, Director, BEHA
Martha J. Steele, Deputy Director, BEHA
Michael Feeney, Chief, Right-to-Know/Emergency Response Program, BEHA
Zi Zhang, Environmental Toxicology Program, BEHA

The Commonwealth of Massachusetts
Executive Office of Health and Human Services
Department of Public Health
250 Washington Street, Boston, MA 02108-4619

WILLIAM F. WELD
GOVERNOR

ARGEO PAUL CELLUCCI
LIEUTENANT GOVERNOR

JOSEPH GALLANT
SECRETARY

DAVID H. MULLIGAN
COMMISSIONER

April 14, 1997

Mr. Thomas Witham, Principal
Gloucester High School
32 Leslie Johnson Road
Gloucester, MA 01930

Dear Mr. Witham:

I am writing to you in follow-up to our recent discussion regarding the final steps in completing the data collection for the symptom prevalence survey being done by our Bureau of Environmental Health Assessment (BEHA) Massachusetts Department of Public Health (MDPH). We feel that the overall data collection efforts on March 11th and 12th went very well. As a result of follow-up with the help of the Assistant Principal's office, we also got additional completed surveys back on March 27, 1997. In total, we were able to collect over 85% of the responses from students, faculty and staff. We would like to thank your office as well as the faculty and students at Gloucester High School for the cooperation and support we received. Special mention is deserved in particular for the efforts of the homeroom teachers in distributing the survey to their students and returning the envelopes to us. This allowed us to collect the information very efficiently.

We have tabulated the surveys completed to date and categorized the responses into groups, i.e., completed; refused or no response after multiple attempts; long term absentees or away from school. As we discussed recently on the phone, we feel it is important to make an effort to reach those individuals who were not at school during our survey. As we agreed, we will enclose copies of the survey instrument with postage paid return envelopes for mailing directly to our office and a list of individuals who were not at school during the survey.

Because we are trying to complete this project as soon as possible, we would like to receive all replies during the month of April. Could you please make individuals aware of this time constraint?

The surveys completed to date have been coded and are currently undergoing data entry by a contractor. Following this, quality control checks will be completed and after that, data analysis will begin.